SENIOR COUNTRY READER

III

BY

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WITH 143 ILLUSTRATIONS

JUL 1913
67

To force the soil to produce its best and help the animal
to live its best, is noble work

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SENIOR COUNTRY READER

III

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TO THE

MEN, WOMEN, AND CHILDREN

OF MY ESTATE,

WHO ARE DEVOTING BRAVE AND HONEST LIVES

TO THE NOBLE WORK OF BRITISH AGRICULTURE,

AND

WITHOUT WHOSE GENEROUS ASSISTANCE

I COULD NOT HAVE WRITTEN THESE VOLUMES,

I RESPECTFULLY DEDICATE THE

COUNTRY READERS

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SENIOR COUNTRY READER III.

SIMPLE PRINCIPLES OF MANURING.

SOIL is formed by the gradual wearing, or crumbling away, of the hard, solid rocks and stones, and by the decay of plants, animals, and manure.

The rocks from which the soil is formed, in some cases lie underneath the soil. In other cases the rocks lie at some distance away, and the particles that crumble from them are carried by water, ice, and wind, and left as soil where you now find them.

Above these hard rocks, and beneath the surface soil, there is found a thickness of earth, not so compact as the hard rocks themselves, and this earth is called the subsoil.

The soil which lies above the subsoil, on the surface, is also composed of particles of rock, but these particles are not so compact, not so close

together, as the particles of the subsoil. In other words, both subsoil and soil are composed of hard rock particles, but of different degrees of fineness and texture.

If you dig deep enough you will find, deepest down, the solid rock, above the rock the subsoil, and lastly, on the surface, the soil that is suitable for the growth of the grasses and crops.

The rocks pass into the subsoil and the subsoil passes into the soil so gradually, that it is often very difficult to say where the one ends and the other begins.

So we may say, that the hard and solid rock is the parent from which both soil and subsoil spring.

Every frost, every fall of snow, every breath of wind, every gleam of sunshine, helps to crumble the coarser stones and the more compact earth into smaller stones and finer soil, until at last there is reached the fine and beautiful soil that runs smoothly through the fingers, the fine and beautiful soil in which the roots of the crops can travel in search of their food.

Then the Plough, the Harrow, and every instrument of cultivation that is used to dig and turn up the soil, contributes to the great work of making a good farming soil.

What is Soil?

If you examine the surface soil, you will find that it is usually made up of sand, clay, a little chalk or limestone, and some amount of humus.

(1) *Sand* is made up of a number of small, clean, hard particles of stone; these very tiny grains do not cling together, do not adhere. Sand therefore makes the soil light and open, so that air, rain, and the sun's rays can penetrate it easily.

(2) *Clay* is composed of particles that are held together by a sticky material between them. In consequence, the air, rain, and heat do not penetrate the clayey soil as easily as they penetrate the sandy soil, but when they do penetrate it, the closer texture of the clay retains the heat and moisture for a greater length of time than does the looser texture of the sandy soil.

Therefore a clayey soil requires more careful *draining than does a sandy soil, otherwise the* surface water does not drain off, but collects in pools, and makes the soil cold and damp, a most fatal state of things for the growth of Farm or Garden Crops.

(3) *Lime* is not a plant food in itself, but it helps to sweeten the soil and it lightens the clay and heavier soils, that is, it loosens the particles and makes it easier to work; but the principal effect of lime is to bring the plant food in the soil into such a condition that the plants, by their roots, can take it in.

(4) *Humus* is of a dark brown or black colour. It is rich in plant food, because it is mostly composed of the decayed remains of vegetable matter, such as stubble, roots, leaves, the green crops that have been ploughed under, the droppings of animals, and the decayed farmyard manure that is placed on the land.

A Good Loam.

The object of all ploughing, harrowing, cultivating, weeding, and manuring is to bring the soil into a good loamy condition, rich in plant food which is ready for immediate use, and rich in stored-up food that at some future day will be suitable for plant food.

A clayey loam contains more clay than sand. A sandy loam contains more sand than clay.

A calcareous or limestone soil, is a soil in which there is a very large proportion of lime.

Sand makes the soil warm and open to the air and moisture, but it does not retain moisture and heat. Clay, on the other hand, makes

the soil moist and enables it to retain heat and moisture.

Chalk makes the land sweet, and renders the plant food in the soil suitable for the plants to feed on.

Humus makes the soil rich in plant food. So you can understand that the best soil is a soil in which sand, clay, lime, and humus are mixed in the right proportion.

What is Plant Food?

Plants take in their food through their roots and through their leaves. Animals wander about on their legs in search of food, and plants by their roots find their food, which is present in the soil and subsoil.

The animals take their food in a solid condition, but plants must have their food in a liquid and gaseous condition, because, as you can readily understand, it is only in a liquid condition that the plants by their roots can take in food. Plant food must also be in a gaseous state so that the leaves can take it in.

The food taken in by the roots and the food taken in by the leaves, combine in the plant itself, and are there made into the whole and perfected food, that feeds the plant and causes its growth and health.

There are four special elements that the farmer

must concern himself about—Phosphates, Potash, Nitrates, and Chalk or Lime.

If the land be deficient in either of these four substances the crops will be poor, and will not pay for the trouble of growing them.

You must remember that the crops, in order to live and grow, are taking from the land compounds containing Phosphates, Potash, Nitrates, and Lime, and that the animals on the farm, in order to live and grow, are taking the Phosphates, Potash, Nitrates, and Lime from the crops on which they feed. These crops, and the animals that are fed on the crops, are mostly sold off the land, therefore the farmer, if his land is to be kept in good and productive condition, must replace these plant foods that have been taken from the land.

The farmer does this by a system of manuring and feeding his stock, and by the ploughing under of green crops.

Of all artificial manures, those containing Phosphates have to be bought most largely by the farmer.

The greater part of the Phosphates that a Grain Crop takes out of the land finds its way into the seed, and is there stored up to feed new plants and new crops.

Young animals, that are reared on a farm,

require Phosphates, especially of Lime, to form their growing bones.

Animals that are fattened on a farm require a supply of Phosphates, to get them ready for the butcher.

Cows also utilize, in their milk, a quantity of Phosphates, which the crops have taken from the land during their growth.

The young animals, the fat stock, the milk, and the grain from the straw crops are sold off the farm. Therefore unless the Phosphates be restored to the land by manuring and cropping, it will in time not pay to farm at a rental of nothing per acre.

The greater part of the Potash that the land requires is in the straw, and if the straw be used in making manure, and then returned to the land, the quantity of the Potash that the plants need will be retained in the soil.

A great deal of the Nitrates, that the plants require, also finds its way into the grain, milk, and flesh that is sold off the land. But this loss of Nitrates is, in a great measure if not wholly, replaced by the decay of the stubble and vegetable remains that are left in the soil, by the use of farmyard manure, and by the ploughing under of clover and green crops, and a very small quantity by the rain, and from the atmosphere.

How to Manure.

As to the importance of keeping a supply of Lime in the soil, read under heading—Manuring the Garden (page 162).

How to manure is really the great secret of successful farming; probably as much money has been lost by farmers buying artificial manures that are not suitable to the land, or that are deficient in plant food, as has been lost by farmers not using any manure at all.

How to manure so as to make the increased yield give one a good return for the cost of the manure bought, and the labour, and how to manure so as to store up in the soil a reserve of plant food, that will be available for future generations of plants, is the secret of successful farming. It is a very difficult question to solve, because so many and diverse conditions have to be taken into account.

The farmer must consider the nature of the soil and subsoil of the land; its position as regards the sun and wind; its slope and drainage; its past history—how it has been fed or manured in the past; whether it has been grazed with well fed stock, and manured with well made manure, or the reverse; if it is deficient in Nitrates, Phosphates, Potash, or Lime.

And when all this is known, then just the

quantity, no more, no less, to be applied to make each acre produce the largest return for the expenditure and labour involved; and also it is important that the manure should be rich in plant food, or in other words rich in Potash, Phosphates, Nitrates, and Lime.

The question that every farmer has to ask himself is:

What sort of manure, and what quantity to the acre, at the lowest cost, must I apply to this field, to wake it up, and to make it yield me a profit now and in the future?

Different Manures.

Of all manures, well-made farmyard manure is the best for the land, and in the end gives the largest return. But remember, it must be well made and well preserved, or it may lose half its value. You will read about this under the heading "Farmyard Heap."

Farmyard manure contains the principal foods that the crops require; namely, Nitrates, Phosphates, and Potash. The solids contain the greater part of the Phosphates and Potash. The liquid contains the greater part of the Nitrates. The straw contains the greater part of the Potash.

Farmyard manure is not only valuable because it contains these plant foods, but it is valuable because of its bulk.

By its bulk it opens up the stiff soils to the air, rain, and sun, and therefore makes them lighter and easier to work; it also helps the lighter and more porous soils to retain moisture. This is termed its mechanical action.

When quite rotten in the soil, farmyard manure contains soluble food which the plants can take up at once, it also contains insoluble food that will become soluble at some future time, and be of service to the crops of that future time. This is termed its manurial value.

In other words, farmyard manure not only supplies food at once to the growing crops, but it also lays up a store of food for the use of future crops, and this is why good farmyard manure is such a safe and valuable manure to use.

It is also claimed for farmyard manure that, as it decomposes or rots, it aids the development and growth of the little germs of life, called bacteria, in the soil, which are all-important to the soil. The plants make use of these little germs to break up the compounds of the soil, and then rebuild the simpler substances into those compounds that the plants can take in. There may be plenty of raw material in the soil, suitable for manufacture into plant food, but unless the little workers are present the crops may starve for want of food. If this be so, then of course we see how much more important

farmyard manure is for the land than artificial manure can be.

As the farmyard manure decomposes it gives off heat, and Carbonic Acid Gas. This heat is especially useful for Market Gardening purposes, because it forces the earlier growth of plants.

CARTING FARMYARD MANURE.

Phosphates.—There are artificial manures, rich in Phosphate, that the farmer buys when he finds the land, especially the grass land, running short of Phosphoric food.

The artificial phosphate manures, which perhaps on the whole answer the best, are Ground Bones, either raw or steamed, and Basic Slag. Much however must depend on the nature,

position, and quality of the soil, and the farmer's own experience and experiments.

Superphosphates are made by treating Bones, or various mineral phosphates of lime with sulphuric acid, so as to convert the insoluble phosphates into a quickly acting form for plants to take in.

Ground Bones.—The raw bones are steamed to extract the fat from them, and then ground into a fine powder. The bones are reduced to this fine powder so that the Phosphates, and especially the Phosphate of Lime, can become more quickly soluble, and so the sooner be taken in by the roots of plants.

At one time the bones were broken up into half-inch lengths, and then applied to the land; but it was found that it took a very long time for the rain to dissolve and make them suitable for the plants to use as food.

Basic Slag is a very useful Phosphatic Manure, and when it is suited to the land some wonderful results have been obtained by its use. Besides Phosphates it contains a proportion of Lime, and therefore it is well adapted for the heavier soils that are deficient in Lime.

Care must, however, be taken to make sure that it contains a proper proportion of Phosphates, in the form of soluble Phosphate of Lime, and that it is exceedingly finely ground.

It is best applied to the land in the late Autumn, so that the rains may have a chance of washing it into the soil.

Nitrates.—Nitrogenous Manures are the most expensive to buy, but if a farmer feeds his stock well, works and keeps the land clean, and crops it on the four or five course system, he will seldom be obliged to put his hand in his pocket to buy nitrogenous manures.

Besides the rain and the farmyard manure supplying Nitrates to the soil, there is another and a natural method of storing Nitrates in the soil.

A wonderful discovery it was, and it has saved many a farmer from ruin.

Experience, the great schoolmaster of Agriculture, had taught the farmer that if he grew Beans, the following wheat crop yielded more straw and a larger yield of grain to the acre.

By growing Beans it was found that there was an unknown something that made the next crop of wheat produce a good yield. It had as great an effect, if not greater, than a liberal manuring of farmyard manure.

At last it was discovered that all the Pea family, viz., Beans, Peas, Vetches, Clover, etc., have the power of capturing the free Ammonia Gas that surrounds their roots and converting it into the Nitrates of the soil, that is, into forms of Nitrates that the plants can take up.

It was further discovered that this is done by little germs or organisms that live at the roots of the varieties of the Pea and Clover plants.

By laying land down to Clover, and grazing it with stock and then ploughing it under, the soil is made rich in Nitrates, which the straw crops specially require for their proper nourishment and growth.

Consequently there is little or no need for the farmer, whose land will lay down to clover, lucerne, or sainfoin, to buy expensive Nitrogenous manures.

It was found that the laying down of land for two or three years to clover, or lucerne, in the succession of crops, (you will read about this succession later), not only manured the land, but gave it a rest. Land like everything else needs rest; although you may manure your land well, still the time comes when it gets sick of the plough—Plough Sick, as it is termed. It requires to rest a while, to reinvigorate itself, and this the clover, or lucerne, gives it a chance of doing.

This is how great discoveries have often been made. I know from experience this and that, but how to explain it? I cannot. Then comes the man of science, the man of knowledge, trained in thought, logic, and observation, and by patient, honest work, and many experiments,

he tries to find out the explanation of the facts that the Farmer has learnt from his own experience.

To Manure by Crop following Crop.

ROTATION OR SUCCESSION OF CROPS.

Here was another great discovery. Experience had taught the farmer that if he grew, in the same soil, the same crops year after year, they began to look weak and unhealthy, and commenced to fall off considerably in yield.

Experience had also taught the farmer, that if he varied the crops he made them stronger to resist disease, and forced them to give him a heavier yield.

Then came the man of science, and the experience and experiments of the farmer, agreeing with his researches and experiments, there was established as a result the general principle of the rotation, or succession of crops.

It was found that if the farmer varied his crops, they grew with greater vigour, and were less liable to be attacked by insects and disease.

It was also found that the different crops each required their own kind of food. One crop required more of one kind of food; another crop required more of another kind of food. One crop sent its roots deep into the soil in search of

its food; another crop sent its roots but a short depth into the soil in search of its food.

For instance, Wheat and Clover send their roots deep into the soil, whereas Barley, Roots, and Oats send their roots but a short distance into the soil.

All these facts were carefully taken into consideration, and many further and carefully tested experiments were made, until at last it has been established that one of the best rotations is as follows:

First Year	Winter-sown Wheat.
Second Year.	Roots (Swedes, Mangels, or Turnips).
Third Year.	Spring-sown Barley and Oats.
Fourth Year.	A Clover Crop.
Fifth Year.	Begin again, as First Year.

In many parts of the country this rotation is varied to meet the different conditions of the soil, and in many parts the farmer, with great advantage, leaves his clover and grass seeds down two, and sometimes three or more years.

In order that there should be no waste of time, the clover and grass seeds are generally sown with the straw crop; the straw crop acts as a kind of mother, a protection to the young and delicate clovers and grass seeds, so that when the straw crop is harvested the Clover Plant, or Ley as it is sometimes called, is firmly

rooted, and requires no further protection, and in a good season has grown to a considerable height.

Even the same Autumn, after the straw crop has been harvested, calves and sheep can be turned on the ley; but they should not be left on sufficiently long to allow them to bite down the herbage too close to the ground, or they will injure the young plants. The following year it is mown for hay. Good clover hay is excellent for milking cows and farm horses, and the green clover is a good food for cart horses during the summer.

A Well-Made Manure Heap.

The loss to the farmers of this country by reason of the badly-made manure heaps must be very great.

If a manure heap is badly-made most of the precious plant food, almost if not quite as valuable as its weight in gold (a hundred pounds of well-rotted manure generally contains 75 lbs. of water, a little more than half a pound of soluble nitrates, about half a pound of potash, and less than half a pound of phosphates), escapes in a liquid form down the drains, or soaks into the ground, or ascends as ammonia into the air, instead of being fixed in the manure heap and placed on the land.

It is reckoned that the loss of this liquid manure decreases the value of the heap by one half, so that if the liquid manure is preserved, and pumped or thrown over the manure heap from time to time, one ton of manure so made is worth two tons of manure the liquid from which has escaped into the ground, or has run away down the drains.

Moreover, the liquid manure is food that the plant can use at once, whereas the solid manure contains food that is not at once available for plant food, but which will be of use at some future time.

So important is the making of a manure heap, that the farmer ought to construct and preserve it himself, or he ought to superintend the making. It is too precious to be left in the hands of a second party.

If you see a farmer managing his manure heap well, you may be nearly certain that his land is in good heart, and that he is farming well.

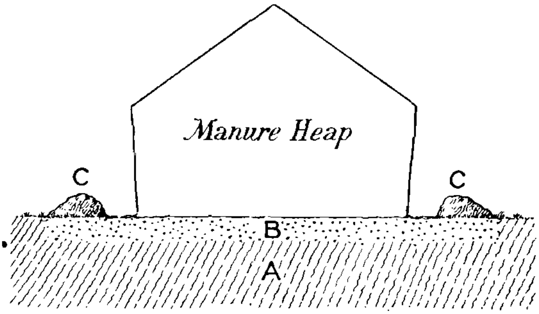
The best plan, of course, is to have covered and spouted stock yards, under which cattle can be fed.

The cattle tread down the heap, and keep it compact and moist.

The liquid from the heap ought to drain into a tank from which, by means of a single pump, it can be pumped from time to time over the heap.

It adds much to the value of the manure, if the liquid from the tank is poured over the heap twenty-four hours before it is carted on to the fields.

Too much straw should not be used, only just sufficient to absorb the liquid.



A WELL-MADE MANURE HEAP.

A, The soil; B, beaten surface or concrete bed; C, ridges of earth thrown up to soak up the drainage from the heap, to be thrown on the heap and replaced from time to time.

The majority of farmers and small holders have not covered yards, and therefore we have to consider how best to make a manure heap in the open.

The bottom on which the heap is to stand, should either be concreted, or rendered hard and water-tight by a layer of well beaten down earth or clay. On this hardened bottom place some sods and grass, or a foot or two of loose earth.

The hardened bottom prevents the escape of liquid into the earth, and the foot or two of loose earth absorbs a great deal of the liquid that runs from the heap. This saturated earth is perhaps the most valuable manure that can be applied to the grass land. The heap should be well pressed down, and above all not allowed to get dry.

When the heap is inclined to get dry, if you have a tank throw the liquid over the heap, otherwise throw some water over it.

To prevent the rain soaking into it and washing away much of the precious plant food, make the heap compact and build it like a well-made stack; from time to time throw a layer of earth over it. Build round the heap a wall of earth, a few inches high, that will absorb the liquid that is draining from it, and when this wall of earth is well saturated, throw it on the heap, and place round the heap another wall of fresh earth.

If the manure heap is made somewhat after this fashion, it will preserve most of the plant food, and you will find a ton of this carefully prepared manure give you better crops than two tons of badly and carelessly made manure.

When soils are clayey and strong, it is best to place the manure on the land almost as soon as it is made, before it is quite rotten, but if the

land is light, it is best that the manure should be well rotted before it is applied.

Spread the manure direct from the cart. It will do a lot of good lying spread over the surface of the ground. In the case of plough land some authorities state that there need be no hurry to plough it under; but in the writer's opinion it is best to plough it under at once.

Remember that well-made and carefully preserved farmyard manure contains all the food, lime perhaps excepted, that the grass and crops require; and that the straw opens the soil and helps to bring it into good condition.

Farmyard manure not only supplies the food that the crops require at once, but what is of equal if not more importance, it lays up a store of food which will be of use for future crops.

Farmyard manure, by its decomposition in the soil, dissolves and so prepares the mineral foods, potash and phosphates, causing them to enter into the combination that the plant requires, and also causes those living germs to thrive that it is thought build up the food, in just the proportion that the crops require.

Farmyard manure, when made on your own place costs nothing to buy. It is simply the waste from your animals and crops, wasted indeed if not carefully made and wisely applied to the land.

A Few Last Hints.

Have as little to do with artificial manures as possible, but if you do buy artificials, see that you obtain an analysis with them.

Attend to the manure heap yourself.

Carefully follow out the succession of crops.

Feed your stock well and wisely, and change them with judgment from field to field, so that the stock and the land may get change.

Spread the droppings on the grass land often, at least in the Autumn and again in the Spring; in the Spring only is not sufficient. If the droppings are left undisturbed too long the grass is killed underneath them, and they cause the growth of unsightly tufts of rank grass, which cattle refuse to eat.

Keep the land clean, free from weeds, Couch grass, and inferior grasses. To do this, keep all hedges and ditches free from weeds. See that the seeds that you sow are strong in vitality, clean, and free from the seeds of weeds.

When possible burn up all weeds and couch grass, and don't throw them on the manure heap.

If you farm after this method, you will keep the land in good heart, a credit to yourself, and, under favourable conditions, farming will bring to you a free, healthy, and happy life, and will yield a reasonably comfortable living.

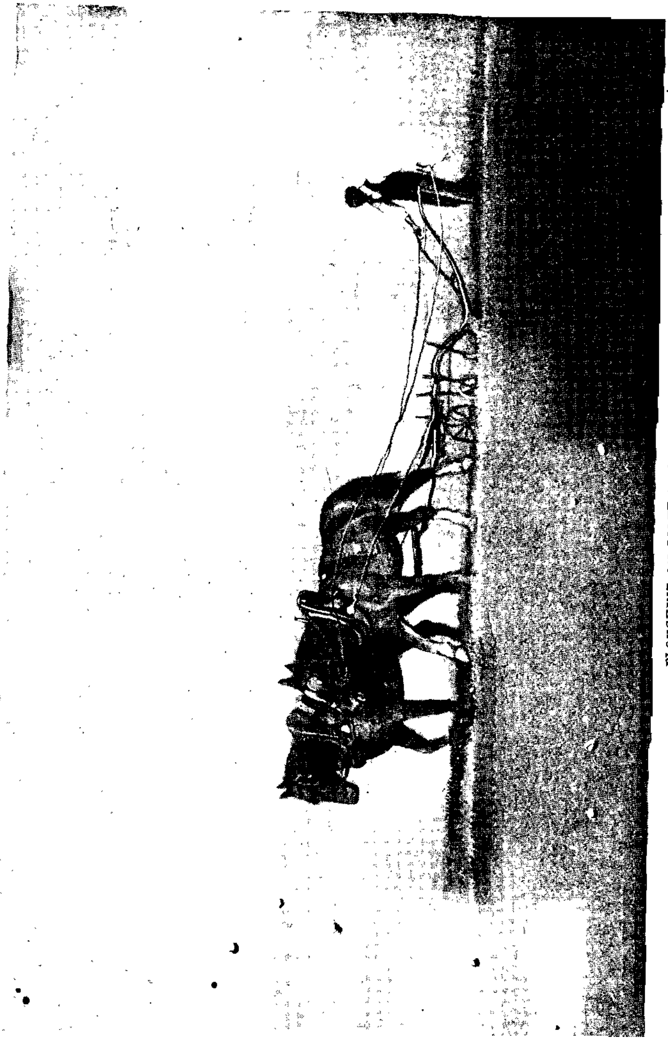
PREPARING THE SEED BED.

Of all work connected with the land, there is none more important than the work of preparing a Seed Bed. To prepare a seed bed, is to prepare a suitable home for the Seeds planted to take root in, and to grow strong to resist the attacks of insects or disease, and to yield a Paying Crop.

First and foremost, the Texture, Tilth or Physical Condition of the soil, must be made a fit and comfortable home for the Plants. Manure is of little or no use unless the soil is in a good state of Texture or Tilth.

Let us now consider what steps should be taken in order to secure a suitable Seed Bed.

First the Seed Bed must be clear of Weeds, because Weeds occupy the ground and so crowd out and kill the young and delicate crop plants as they appear above ground, and Weeds also use up tho moisture and available plant food that is stored up in the Seed Bed, and as a consequence the crop may run short of food.



PLOUGHING ON LIGHT LAND.

Weeds, and this is important, harbour and support many injurious insects till the crop is above the ground, and then these pests, finding a plentiful supply of agreeable food springing up all around them, transfer themselves from the Weeds to the young and delicate crop, and multiplying with great rapidity often commit fearful havoc.

For the same reason, all weeds that grow around the Seed Bed, in the Hedges, Ditches, Headlands, or Banks must be got rid of.

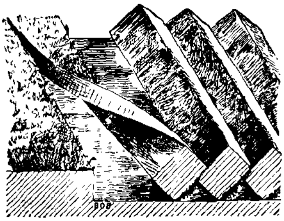
This clearing of wild growths from the ditches and hedges, and on banks, tends to destroy a great deal of the natural beauty of the Lanes and Fields, but the clearance must be made if the fields are to be cultivated to the best advantage.

Preparation of Soil.—The Soil must be turned up or inverted, as deep as the subsoil will allow, and as deep as the Plough will permit. This is done to expose the under part of the surface soil to the influence of the sun, air, and rain.

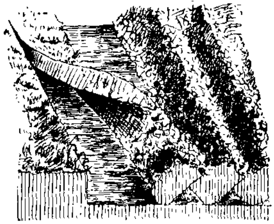
The Seed Bed must not be in lumps or clods, but in that state of suitable subdivision that will retain moisture, admit the air, and enable the young plants to get a firm root hold of the ground, and so force their way to the light without too great an effort.

When the Seed Bed is in this beautiful state

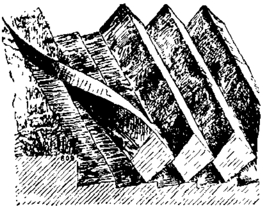
of subdivision, the physical condition of the texture of the soil is said to be "A good Tilth."



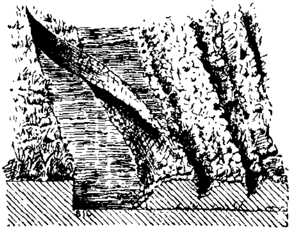
No. 1. Rectangular Furrow, Unbroken.



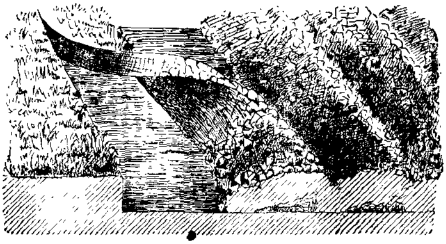
No. 2. Rectangular Furrow, Broken.



No. 3. Crested Furrow, Unbroken.



No. 4. Inverted Furrow, Broken.



No. 5. Wide Broken Furrow.

VARIOUS FORMS OF FURROWS

Compact or lumpy soil is made more "mellow" when its particles are reduced in size.

Very Loose or Leachy soil, is improved if its particles are brought together and compacted, because then the soil becomes more retentive, that is, it retains more moisture, and so in summer weather does not dry up too quickly.

It must always be remembered, that the only manner in which the plants, or crops, can take food is in a liquid condition, so the soil may be full of plant food, and yet if it does not contain sufficient moisture, in which the food can be dissolved, the plant cannot make use of it.

Each particle of a well prepared seed bed is surrounded by a film of moisture, and by this moisture the plant food is dissolved.

The roots of the crop twine themselves around these soil particles in their search for food; therefore the more particles the soil is composed of—other conditions being equal—the greater is the area over which the roots of the crop can search for their food. In other words, the larger is the crop that a Seed Bed will support, when the soil is in a right state of mellowness or subdivision.

As an American writer states:—"Suppose the particles of one of your Ploughed fields are one inch square, on each side of the cube. If one of these cubes be broken into smaller cubes measuring one-eighth of an inch, you have increased eight times the root pasturage, or you have

increased eight times the root contact, or film moisture, or you have increased eight times the feeding area of the plants. By superior tillage you have extended one acre into eight acres, whilst by slovenly tillage you can reduce eight acres into one acre. So a skilful farmer by superior tillage, can produce as much from fifty acres as a careless and ignorant farmer can produce from four hundred acres."

More depends on the brain and knowledge of the farmer than on the size of the farm.

Although the Seed Bed must contain sufficient moisture, to keep the plants of the crop supplied with the nourishment necessary for their life and strength; yet it must not contain too much moisture, because if it does the excessive moisture will wash out of the soil, either by surface drainage or under drainage, a quantity of plant food, and so the land will gradually become impoverished.

The ideal condition is for the seed bed to contain just that degree of moisture, by which the necessary plant food can be dissolved, that can be taken in by the plants as they need it. Above all, the Seed Bed must contain no stagnant water, for in stagnant water no crop can thrive.

The Temperature of the Seed Bed is important, for no seed can begin to grow till the tempera-

HARROWING THE SEED BED.

ture of the soil reaches a certain point. For instance, wheat and oats begin to germinate at a temperature of between 45° and 65°. To secure a warm Seed Bed, it should rest on a well-drained foundation or subsoil; if the subsoil is not well drained, but retains an excess of moisture, the cold will naturally strike upwards and lower the temperature of the surface Seed Bed.

The application of well made Farm Yard Manure is another method of giving warmth to the Seed Bed. This manure not only adds plant food to the soil, but it improves its physical condition, adds to the germ life of the soil, and increases its water-holding capacity, and by facilitating the entrance of the air equalizes its temperature. Farm Yard Manure increases that most valuable asset of the Seed Bed, the dark-looking mellow Humus. It has been well said, that the mineral portion of the soil gives the Seed Bed body and that Humus gives it life or heart.

Most of the plants that we grow in our fields start from small seeds—grass and clover. These seeds are specially small and light, and contain a very small quantity of stored food, so directly the tiny plantlet begins to grow it must start its life in a comfortable and easy home, and it must find all around it a quantity of food ready

ROLLING THE SEED BED.

manufactured, in a liquid condition, for its delicate roots to absorb. This home of stored food is within a few inches of the surface. Clover roots go down deeper it is true,—this is one reason why the clovers are such valuable plants for penetrating the subsoil, as they improve and add to the physical condition of the surface soil,—but the majority of our quick-growing crops secure their nourishment from the surface soil.

If this surface soil is not in a friable condition, free from weeds and well supplied with plant food, the plants must search wide and deep for food, and so instead of spending most of their vitality in producing an abundant yield, they exert it in desperate efforts to find food.

You cannot have it all ways; if you require yield, you must cultivate and manure on the wisest plan known.

It is as well that the Seed Bed, especially if it be of a clayey nature, should contain some stones, because in summer they help to keep the land cool by checking too rapid evaporation, and in the winter they retain warmth in the soil. Stones, moreover, are acted upon by the weather —weathering, as it is termed. Wind, Rain, Frost, and Heat, are all what are termed disintegrating forces, and these forces, slowly but surely, crumble the stone away into

fine soil, and so the depth and physical condition of the surface soil is gradually improved by their presence.

Manure.

Supposing that the Seed Bed, by good tillage, has been made into a comfortable home for a future crop; in addition to this the seeds must have, directly they begin to grow, a liberal supply of suitable food, that they can obtain without too great an effort.

How to know whether the Seed Bed contains the necessary food is a very difficult matter indeed to decide. You may have good hopes that the food is there if the field in the past has been kept clean, well cultivated, and judiciously manured. A clever farmer by handling the soil and knowing its past history, and learning something of his neighbours' experiences, and by watching any experiments that have been tried in his district, may perhaps know the particular plant food that the Seed Bed requires, or whether it requires any additions at all.

A sample of soil can be sent to the county analyst, and for a very small fee a report will be given, but the experience of the practical farmer having a knowledge of his farm would be of more immediate value.

Not only should a chemist analyse a sample of the soil, but he should see for himself the position of the field, its aspect to the sun and wind, the nature of its subsoil, and above all he should learn its past history, how it has been treated, cropped, grazed, and manured.

When the analyst learns all this for himself, and analyses the soil which he himself collects from the field, then his opinion may be of some value, but not otherwise.

Every man who farms ought to be in a measure his own chemist, and conduct his own experiments. As he proceeds with his usual farming operations, he can set aside a small strip in each field, and experiment thereon with different manures, and test which crop or which variety of crop is most suitable.

The vast majority of practical farmers have not the inclination, and it may be they have not the knowledge or time to conduct experiments for themselves, and so perhaps the old system of farming is for the majority the most practical system—namely, to manure the land by rotation of crops, the ploughing under of the clover roots; to make all the Straw grown on the farm into good farm yard manure, and to apply it skilfully to the land, and to cultivate the soil well and keep it clear of weeds.

If this has been done in the past, you may hope that your Seed Bed contains a sufficient number of minute living germs, and a store of available liquid plant food, to secure a paying harvest.

No one can say what an acre could produce. Agricultural knowledge, especially as regards manuring and cropping, is in its infancy. But the writer is under the belief that future generations of farmers, whether in this country or elsewhere, will compel the acre to yield a hundredfold more than it yields to-day, even when farmed by the wisest of our modern farmers.

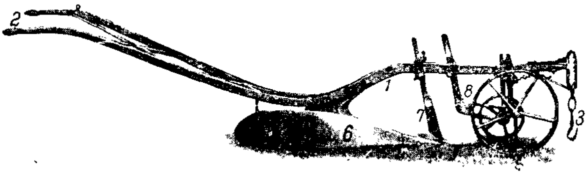
Agricultural Implements.

What are the mechanical appliances that the up-to-date modern Farmer uses, to make the Physical Conditions of his Seed Bed a comfortable and secure place of abode for his crops? As time marches on and knowledge grows, these tools will be improved upon, and it may be fresh implements invented, which will probably save expense in working the land and improve its yielding capacity, and so make Agriculture a more paying business than it is to-day.

When the crop is harvested, the productive or surface soil is inverted, or turned up by the plough into ridges and furrows. The depth to

which the plough works depends very much on the depth of the surface soil, before the subsoil is reached, and the nature of the plough itself.

Great care and judgment are required, or great damage may be done by bringing to the surface part of the unprepared subsoil.



SINGLE FURROW PLOUGH.
1, Beam; 2, handles; 3, draught chain; 4, share; 5 furrow wheel; 6, breast; 7, coulter; 8, skim coulter.

At the same time the plough ought to go as deep as the surface soil will permit, so that as great an area as possible may be converted into a resting and feeding ground for the crops. As a rule the plough turns up, or disturbs, the land from four to eight inches in depth.

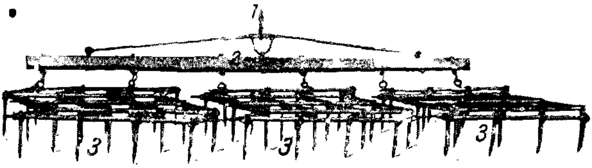
The depth of the ploughing ought to vary. If the Plough is worked year after year at a fixed depth, in time, beneath that depth, there will be formed a hard bed, a "Plough Pan," as it is termed. This hard Pan, holding the water and preventing it draining away, will cause the surface soil to become cold and damp, a fatal state to the well-being of crops.

The plough is used to invert or turn up the Surface Soil, so that the Sun, Rain, Wind, and Frost may sweeten, aerate, and warm it.

The plough in turning up the soil roots up the weeds, and brings them to the surface.

Plough furrows are broken up or spread by the Cultivator. The Cultivator breaks up and spreads the furrows without inverting or turning the soil.

A sharp toothed Harrow is used to work the soil into a fine state of subdivision, at the same

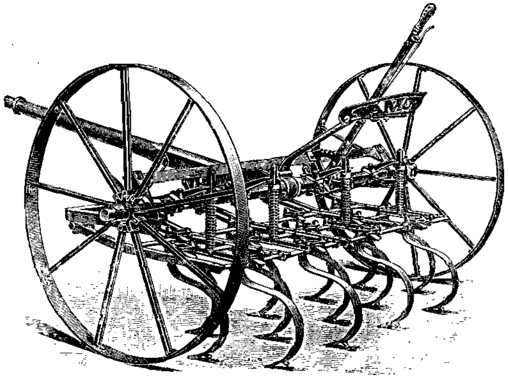


ZIG-ZAG HARROW.
1, Hake and draught chain ; 2, draught beam ; 3, teeth or tines.

time the Harrow drags out the weeds and Couch Grass (which spreads by underground root growths), and any rubbish that may be in the soil.

The Plough and the Harrow do for the Seed Bed what the spade and the rake do for the garden. The Plough turns the soil up, and the Cultivator and the Harrow work the turned up soil into a fine state of subdivision and clear the land of weeds.

The Roller is used to break up the clods, and consolidate or make firm the seed bed, either before or after the seeds have been sown—this compact condition is needed to enable the roots of the crop to take a firm and secure hold of the soil.



THE CULTIVATOR

All this Ploughing, Cultivating, Harrowing, and Rolling, is called working the land or Tillage operations.

Tillage operations, turn up and subdivide the soil, extend the feeding area of roots, preserve moisture, check evaporation, render the temperature and moisture of the soil more even

Tillage is another method of Manuring.

In most cases the growth of weeds is the result of faulty management of the land. Let your first attention be given to good tillage and rotation of crops, so that no one kind of weed can become established, and if the land is fully occupied by strong healthy crops suitable to the soil, you will have little or no trouble with weeds.

No fixed rule can be laid down as to the particular time that the land should be worked. That must depend on the physical condition of the land and the state of the weather.

On the heavier or clayey soils great care must be taken not to work the land when it is wet, otherwise it will cake or clod and great damage will be done. The farmer who is farming this land, must watch his opportunity and put his implements to work when the conditions are suitable.

This can only be learnt by experience. The lighter lands on the other hand can be worked when they are wet, and no great damage will be done.

Many farmers get their work well forward, by ploughing their stubbles under directly the straw crops are harvested, although they do not

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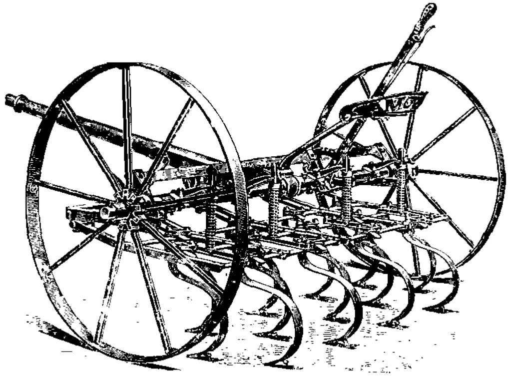

THE CULTIVATOR

All this Ploughing, Cultivating, Harrowing, and Rolling, is called working the land or Tillage operations.

Tillage operations, turn up and subdivide the soil, extend the feeding area of roots, preserve moisture, check evaporation, render the temperature and moisture of the soil more even throughout the year, hasten the chemical action of the soil by aiding it to set free plant food, admit air and hasten the decomposition of manure.

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Many farmers get their work well forward, by ploughing their stubbles under directly the straw crops are harvested, although they do not intend planting till the following Spring. This answers well on the heavier lands. Alternate frost and thaw gets into the soil so exposed and helps to break it up. The frost freezes the

moisture between the particles of the soil and this forces them apart, breaking the soil into smaller fragments, and when the thaw comes the particles draw closer together again.

This expansion and contraction of the soil makes it mellow and sweet, and when the time comes to prepare the Seed Bed renders it easy to work.

When you see one of those smooth Seed Beds think of what you have read. Consider all the work that those beautiful, red-brown fields have cost the Farmer and Labourer. The thought, labour, and money that have been expended, in the hope that the harvest may pay for it all, and leave something over.

Don't think of those expanses of land as mere dead inert masses of soil, to cause no wonder and to create no respect. But pause and consider, they are the abode of myriads and myriads of minute forms of life which are busy, so very busy, in breaking down and building up plant food in just the proportions that the crops can take in. How important are those simple tiny lives. Because of those lives we live. They help to bring wheat to our mills, and oats to the manger for our cattle. Had we eyes to see and ears to hear, and minds to understand, what marvels would those barren stretches awaiting the harvest seed unfold to us.

STRAW CROPS.*

Wheat.

THERE are three principal straw crops grown in this country, Wheat, Oats, and Barley.

The chief basis foods of the world are derived from Wheat, Rice, Dates, and Bananas. The foods made from these crops, in the respective countries in which they are cultivated, form the foundation of the food of the people living in those countries. In other words, more people live on these foods than on any other foods yet discovered.

With the spread of the English-speaking race and of the European nations, the consumption of wheat is rapidly increasing over all other foods.

Therefore of all crops grown Wheat is the most important and the most interesting to study.

The round from the sowing of the grain, to the harvesting and turning of it into bread, how interesting is the process throughout.

From grains of wheat into a loaf of Bread,

* The ears of the various corn are photographic reproductions from specimens kindly supplied for the purpose by Messrs. Gartons, Ltd., Warrington.

how much there is to learn of what is already known, and how much more there is to discover that is at present hidden.

In the rotation of crops, as a rule, Wheat follows on after Clover. Clover, as you have read, when ploughed under stores up Nitrates and Potash, which the Wheat crop requires for its food. The Clover roots strike down to a considerable depth into the soil and sub-soil, and so when this crop is ploughed under it not only provides a store of food for the future straw

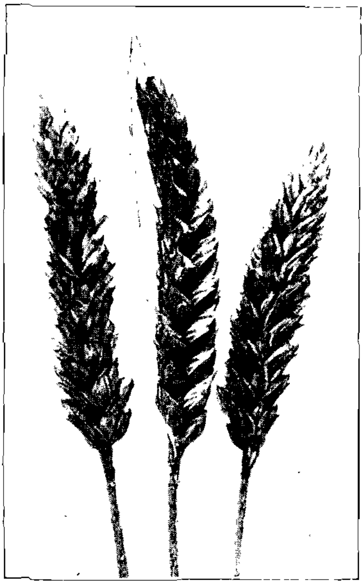
WHITE CHAFF WHEAT. (⅔ nat. size.)

crops, but it gradually converts a greater depth of subsoil into surface soil suitable for the straw crops to thrive in.

The heavier or reddish-tinted soils are the

most suitable for growing Wheat. The lighter and more gravelly soils are more suitable for growing Barley.

An application of Lime to land that is deficient in Lime, in most cases increases the yield of grain and weight of straw very considerably. Not only does Lime increase the yield of grain, but it makes the grain harder and less watery; a quality that the miller requires if he is to make the best flour. In other words, it helps the land to produce a strong Wheat. And this, as you will read later on, is of the utmost importance.


RED CHAFF WHEAT. ($\frac{2}{3}$ nat. size.)

After September the stock as a rule cannot get much feed from an old clover ley. Therefore when the harvest is gathered, and the land is ripe for the plough, the Clover Root is ploughed under. If a crop of Spring Wheat is desired, ploughing in the fall or Autumn makes the

Seed Bed much easier to work and prepare in the following Spring.

BEARDED WHEAT. ($\frac{2}{3}$ nat. size.)

If the Wheat is to be sown in the Autumn, the surface is harrowed just before seeding; but care must be taken not to reduce the clods of

earth more than is necessary, as when the surface is left in too fine a state of subdivision in the Winter, it tends to bind together and the drying winds of Spring may form a kind of cement covering, which is called a "Winter Cap," that is often hard to break up, which naturally interferes with the growth of the winter-sown crop.

The Seed Bed must however be compact, and yet not too compact, and must contain a suitable supply of moisture, and yet not too much moisture, and must contain a store of prepared food for the growing crop to live on.

The Seeds at one time used to be sown broadcast with the hand, but now the rule is to sow them with the Drill, in straight rows and with suitable spaces between the rows. This method of drilling in the seeds secures a more even and productive crop, and effects a saving in the quantity of seed sown.

Winter sown wheat is generally left to itself, but if in the early spring the roots should be attacked by the Wire Worm or Leather Jacket, or the surface ground be very loose, it is best to roll it, in order to consolidate the ground around the roots. As to the treatment of the crop, there appears to be no fixed rule; farmers, however, usually roll and harrow it in the Spring, and hoe between the drills to clear the crop of weeds,

BEARDED RIVETTS WHEAT. (⅔ nat. size.)

There are two distinct varieties of wheat planted, namely, Red, and White.

Some farmers, in order to prevent the crop

being attacked with a disease termed "*Smut*," dress the grain with Blue Vitriol before sowing it. Some farmers state that dipping the grain into liquid gas tar, and then drying it by mixing it with some quick lime, will prevent the rooks and birds taking the seeds after they are sown.

Harvesting Wheat.

Before the Wheat is quite ripe, that is when the straw below the ear turns slightly yellow, the Self-Binder is set to work. This wonderful machine cuts the standing Wheat, binds it with string in bundles called Sheaves, and drops them on the ground at even spaces apart. Men then follow the machine and gather these Sheaves together and build them into Shocks or Stooks.

In collecting the Sheaves and standing them upright into Shocks, place them in a position to get all of the sunshine possible, and take care that the sheaf bottoms stand well on the ground, and that their heads are brought together at such an incline or angle, as will allow any rain that falls to shoot off them. If rain soaks into the Sheaves and thoroughly wets the straw and grain, great damage may be done.

A man driving two good horses harnessed to a Self-Binder, will soon turn a field of stand-

ing corn into string-bound sheaves, lying on the ground at even distances apart.

The old-fashioned method was for a number of men to cut the crop with the Scythe, and they were generally assisted by their wives and families. The wife and children gathered up the Swathes of grain into heaps, and prepared the Bands for tying up the sheaves, and otherwise helped the men with the lighter part of the work.

The bands for tying up the sheaves were made of a handful of the straw crop, plaited or folded at the ears, so that two lengths of the straw went to each band, and the pressure of the tied-up sheaf prevented this band from coming unfolded.

A man with his family, or whoever was working with him, commenced in a certain part of a field and did as much work as they were able. When the harvest work was completed the portion they had reaped was measured, and payment made for the work at so much per acre.

During the time he was at work the man would receive a reasonable amount on account of his work, and the balance of the sum earned, after the harvest. You can at once understand how much quicker, and less expensive, the newer method of harvesting with a Self-Binder is, than the older method of harvesting with the Scythe.

THE SELF-BINDER REAPER.

The bundles or sheaves leave the machine tied up ready for shocking.

If wheat is left until it is too ripe, the grain is not only whipped out by strong winds, but a quantity of grain may be lost in the cutting and harvesting.

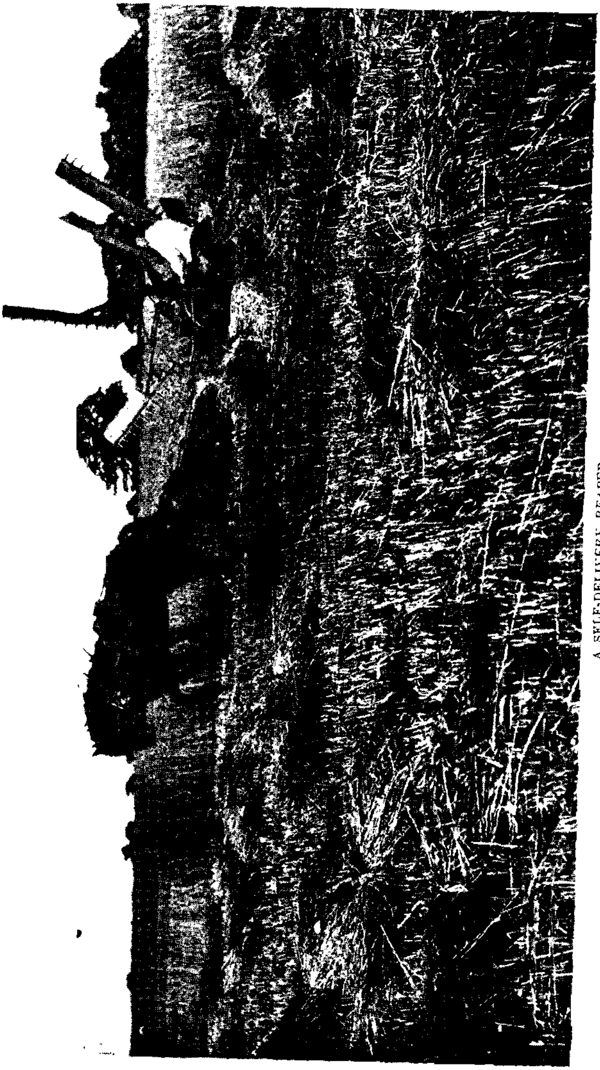
Also, if the crop is ripe when cut, the Bran or outer coating of the grain increases in thickness, at the expense of the inner and finer flour.

The crop, collected and standing upright in Shocks, is generally left out in the fields from ten days to a fortnight, in order to allow the grain to harden and ripen. If the crop is stacked too soon the grain will ferment, that is it will become mouldy, which will decrease the value of the Corn.

Before carrying care must be taken to make sure that the straw, especially the straw below the bands that tie the sheaves, is dry. If the crop is thoroughly dry, a heavy dew or slight shower of rain need not stop harvesting operations.

Stacks and Straw

Should be laid on bottoms that will allow the air to circulate freely. In building a Stack the middle should be kept higher than the outsides, as owing to pressure the middle sinks in more than the sides. If the Butts, or external part of the sheaves, rest in the stack higher than the ears, any rain that finds its way into the stack

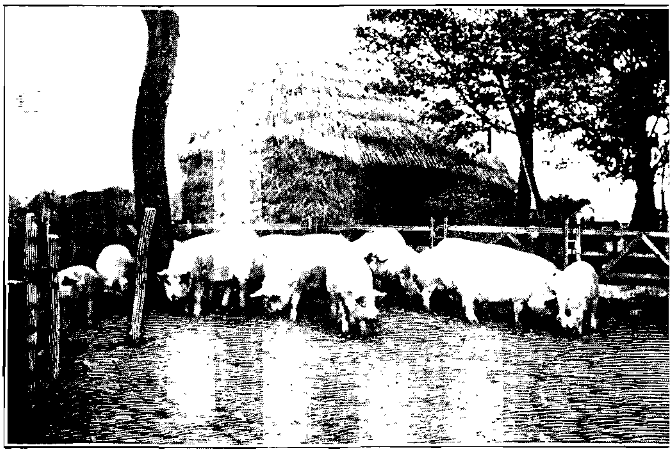


A SELF-DELIVERY REAPER.

With this machine the bundles or sheaves have to be bound or tied up by hand.

soaks into its inner portion, instead of being shot to the ground.

The upper portion of a well-built stack should bulge out beyond the lower portion, as this allows the rain that drains from the thatch to clear the bottom of the stack.



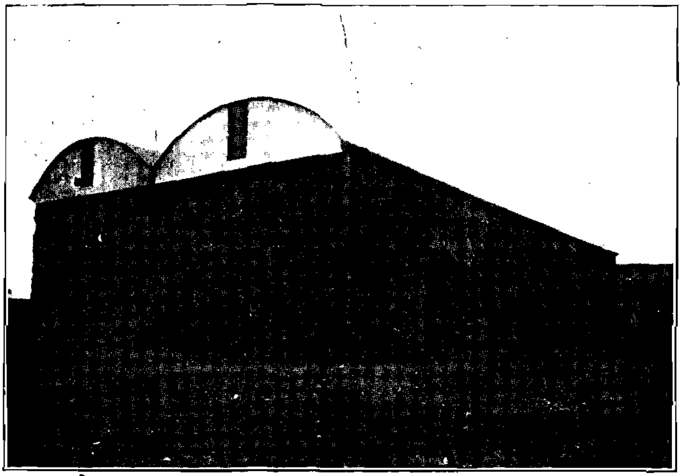
THE OLD METHOD OF STACKING.

After the stack has settled, if not under cover of a Barn,—called a "Dutch Barn," it must be thatched.

Even more wonderful than the Self-Binder, that lays the wheat low, is the Steam Thrasher that shakes out the grain from the ear, and separates it from both chaff and straw.

By a wonderful system (too complicated to explain here), of beating, shaking, and fanning,

the corn flows into sacks in three separate streams. (1), The Head or best corn, that is the well cleaned and best grains; (2), the smaller grains, Tail Wheat as it is termed; (3), the very small grains and odds and ends of seeds and dirt, which is generally given to the Poultry.



A DUTCH BARN.
The new method of stacking.

Whilst the wheat is flowing into the sacks the chaff comes out of a separate outlet, and from another the straw issues, bound up with string in bundles or Trusses, ready to be pitched on to the straw stack.

There is no straw so useful to put under, or bed down, your animals as Wheat Straw, and no

straw that makes such a useful manure, especially for application to the heavy lands.

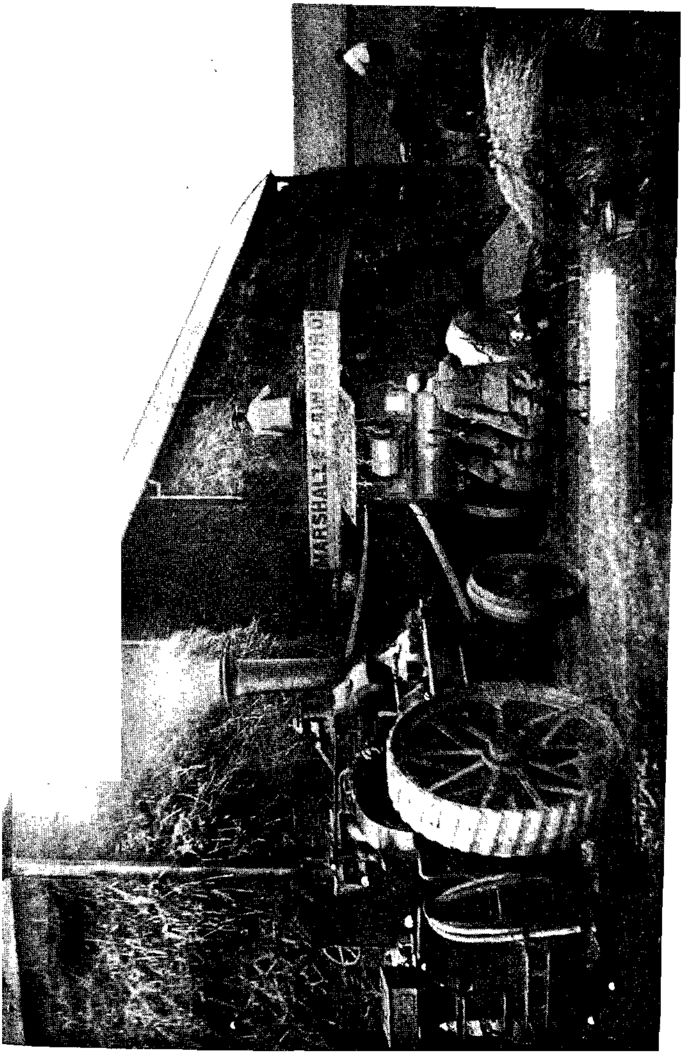
Wheat Straw is more bulky, harder, stronger and more flinty than either Barley or Oat Straw, and for this reason it is admirably adapted for absorbing moisture, and for keeping an animal healthy and clean.

There is nothing that keeps a Pig cleaner and in a more healthy condition, than a good bedding of clean Wheat Straw. On the other hand, when chopped, on account of its hard flinty nature, it is not such a good food as either Barley or Oat Straw. Oat straw contains more nourishment than either Barley or Wheat Straw.

Even if the Wheat crop does not pay to grow for the sake of the grain, it is advisable to grow a certain quantity on every farm, in order to provide bedding for the stock and manure for the Land.

Not only does Wheat Straw absorb and retain the Liquid Manure, but when applied to the land as Farm Yard Manure, on account of its bulk and nature, it renders the heavier land easier to work, and, makes the lighter lands more compact, and more capable of retaining Moisture and Plant Food.

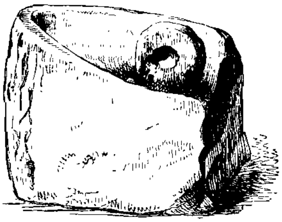
If Stacks have to be thatched Wheat Straw is the most suitable for the purpose.


MARSHALL

From Wheat to Bread.

Wheat Grains or Wheat Berries. You all know a grain of wheat by sight. How wonderful it is that those hard, shrivelled, yellowish-tinted grains when made into bread, help to support in health and strength such vast numbers of men, women, and children.

If we did not know how it was done, and anyone placed on our table the number of grains that would make a four-lb., or quartern, loaf of bread, and beside these grains placed a crisp, sweet, white loaf of bread and said, "I can turn those grains into a loaf of bread just like that loaf"; should we believe them? We should probably shrug our shoulders and say, you must be mad, the thing is impossible. It is simple enough when we know, but when we do not know it seems impossible.



ANCIENT CORN CRUSHER.
Dug up in Anglesey. The Stone Muller or Roller having its sides hollowed for the hands of the grinder, who worked it back and forwards on the stone bed. (From Tylor's *Anthropology*.)

Grains of wheat vary in colour, some are white, some are yellow, some are brown, and others have a red tinge.

If you take a grain of wheat in your hands

and pull it to pieces, you will find that it is composed of three distinct parts, the Bran, Kernel, and the Germ.

The Bran is a covering and a protection to the berry. The Kernel, which we turn into bread, is a store of food for the Germ to live on, till

INDIAN WOMEN GRINDING CORN.

the wheat plant has grown strong enough to gather for itself the prepared food from the soil.

The Germ is the sleeping life of the next year's harvest.

Therefore you can see that the Bran protects the Kernel and Germ, and the Kernel feeds the Germ.

Wrapped in the Germ lies the life of t wheat grain. This Germ is of a clear yell colour and has a sweet nutty flavour; possesses also much strength and nourishmen which ought to find its way into the loaf bread. Unfortunately, owing to the foolish craz for white flour and a very white loaf of bread the millers are obliged to extract the Germ fron the flour.

If the Germ was left in the flour, it would give the loaf a yellowish tinge and keep it moist.

When the wheat grain is planted and the sun and the rain warm and moisten the soil up to a certain point, the Germ begins to feed on the Kernel and commences to grow. It goes on growing by the help of the stored food in the Kernel, till the wheat plant is sufficiently strong to gather food for itself from the soil and air.

Soon there appears over the red-brown ploughed fields a shimmer of straight, thin, green lines, and then slowly the brown earth is hidden, by the beautiful carpet of green that you see overing the fields in the Spring and Summer.

If the season is a growing one and the plants re not checked by frost, cold winds, or want of unlight and moisture, in June the ears of wheat rm their tiny inconspicuous flowers, which ming into the soft wheat berries, at last reach eir proper size and shape.

Towards the close of the Summer the sun is very scorching and the atmosphere dry, and this weather helps to turn the green stems of the plants into the golden-coloured straw, and then it is that the green, soft grains of wheat harden or mature into the dry wheat berry.

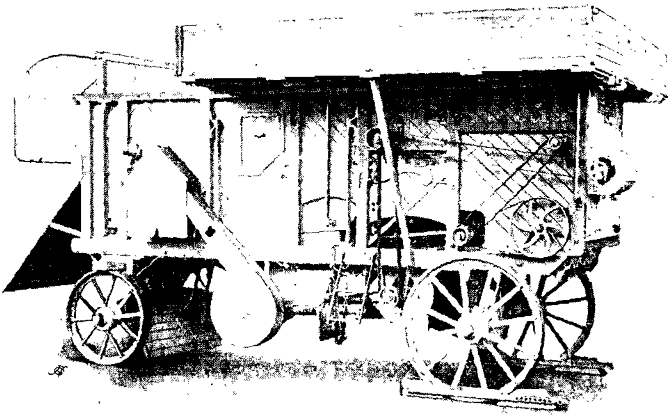
If the latter part of the Summer is wet, the grains do not harden as they should, and therefore they do not make such a strong and good loaf of bread.

A strong and weak wheat. The difference.

The millers now tell us that no matter how much wheat we grow in this country, if we are to make the best loaf of bread, we shall be obliged to import a certain amount of wheat from abroad, and they give us these reasons.

They state that the baker requires three things in the flour, namely colour, strength, and flavour. Colour, they say, can be obtained from almost any wheat grown. Strength, they say, can be obtained best from the hard, dry wheats grown in the North Western States of America, Canada, and the Baltic provinces of Russia. Flavour, they say, can be obtained cheapest and best from the English wheats, provided the English wheats have been grown from good seed in suitably manured soil, and harvested in ripe, dry, hard condition.

It is a most unfortunate fact, that the climate and soil of our country will only grow what is termed a weak and somewhat moist wheat. That is a berry that is rich in starch and it may be of excellent flavour, but a berry that does not



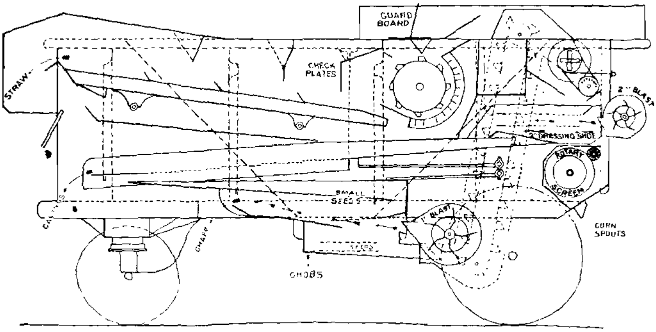
THRESHING MACHINE.

contain the right quality of what is termed Gluten.

The bakers now tell us that if they are to bake the best quality of bread, they must have a flour that contains a certain proportion of the right quality of Gluten.

Do not forget that the quality of the Gluten is of extreme importance in baking. When the yeast and water is mixed with the dough, it

expands into a spongy mass, and when the spongy mass of flour and yeast is in this inflated condition, it is placed in the oven. The heat then still farther causes the shaped loaves to rise, and if the Gluten is not strong and of the right quality, the loaf instead of baking into a light, good-looking, digestible loaf of bread,



SECTION OF A THRESHING MACHINE.

drops into a flat, puny, ill-looking, indigestible loaf of bread.

The Chemist, Miller, and Baker moreover tell us, that a wheat which is strong in Gluten bakes into a loaf which when eaten makes muscle,—whereas a weak wheat, that is a wheat weak in Gluten, contains a large amount of starch and moisture, and bakes into a loaf that when eaten makes fat and warmth.

It is thought that these strong and dry wheats can only be grown in countries where the soil is

suitable, and where the Summers are hot, short, and dry.

The American spring wheats are said to be the best of all wheats, and conjure up visions of

MILLER'S CART.

well-baked bread, of good colour, flavour, and strength.

Some Canadian wheats make a lofty bread, porous and elastic, leaving nothing to be desired.

If you take in one hand a sample of these hard wheats, and in your other hand a sample of well grown English wheat, and compare them, you will at once be struck by the difference in their appearance.

The American and Canadian grains will look

small, dry, and shrivelled, whereas the English grains will look fat, round and well nourished. If you judged by looks alone, without the least hesitation you would select the English grain as being the best. In order to bake the best and most profitable bread, it is now the custom of many millers to mix their wheats for grinding. The following method is used by an experienced English miller who conducts a large business.

40 per cent. Oregon Wheat, for colour.
30 per cent. Spring American Red Wheat, for strength.
10 per cent. Russian Wheat, for hardness.
20 per cent. White English Wheat, for flavour.

Each miller has probably his own system of blending, and this of course must vary with the quality of the wheat grown during different seasons.

One of the best loaves of bread for sweetness, lightness, flavour, and crispness of crust, that the writer ever tasted, was made from second flour, bought from a local miller, half of which was milled from foreign wheats, and half from the best English wheats, and the loaf baked at one of his own farm houses.

Can English wheats be strengthened ?

Great efforts are now being made to grow a wheat in England that, while retaining its old

English flavour, its abundant yield and strong straw, will possess some of the hardness and strength of the best American, Canadian, and Russian varieties.

Time and experiments will alone prove whether this can be done. It must be remembered that the Summer where these strong and dry varieties of wheat are grown is short, hot, and settled, so that the grain ripens quickly, unchecked by rain and excessive moisture in the air. Such weather is very seldom experienced in this country.

There is another point to consider. If these hard varieties can be grown in this country will the yield, or weight of grain to the acre, be as large as the yield obtained from our more starchy and weaker varieties.

And if the yield is not so great, will the higher price obtained for these stronger varieties compensate for the deficiency in yield. In average years, the best hard foreign varieties will fetch three shillings per quarter more than our best English wheats, and when the seasons are against us here, these hard varieties fetch six and seven shillings per quarter more.

A well-known English baker, who has always believed that the best loaf is made only when some 50 or 60 per cent. of English wheat is used, says that so weak and moist were the English

wheats harvested in 1902 that he could not use any of them.

Then there is the further question of the straw. Will the straw of the stronger and harder varieties, if they can be grown here, make such a suitable manure for application to our lands, and will the straw be as long, strong, and abundant as the straw that our present crops yield?

There can be no question if we can grow a strong variety of wheat, which will not suffer in yield of grain, quality and quantity of straw, that the stronger varieties ought to be cultivated.

Another interesting point, which future experiments can alone decide. Supposing you sow the seeds of a hard variety of wheat, will it under the influence of our climate and soil, lose its distinctive hard characteristics, and gradually revert back to our present weaker English characteristics?

The result to aim at, as far as our soil and climate will permit, is to grow a wheat that will retain our present yield in grain and quality and quantity of straw, and to combine these essentials with the hardness, dryness, and richness in gluten of the best Canadian, American, and Russian varieties.

The writer is of opinion, that if wisdom and knowledge is shown in manuring, cropping, and cultivating the soil, and in sowing good

strong seed, the character of our English wheats for milling purposes may be considerably improved.

In this country, taking all things into consideration, a farmer is farming his land well and skilfully, if he averages 35 to 40 bushels of wheat to the statute acre.

In 1901, throughout the United Kingdom there were 1¾ million acres under wheat cultivation, which produced about 52 million bushels of wheat. In the same year (1901), our people consumed 240 million bushels of wheat. So that in 1901 we grew wheat enough to support ourselves for 90 days only, and the remainder we imported from over the seas, either in the form of grain or flour.

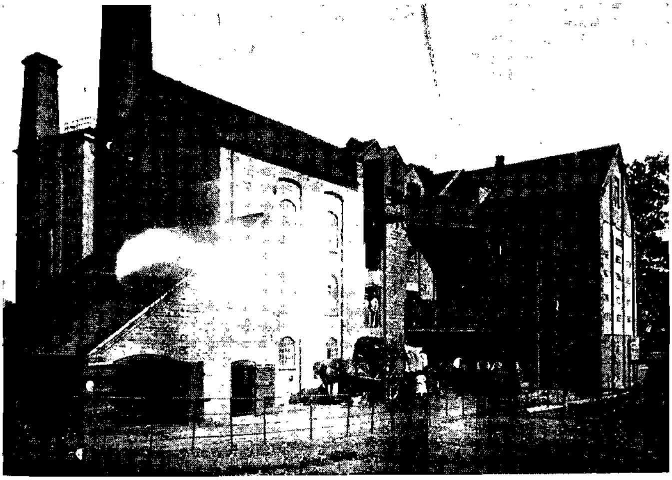
Of the 188 million bushels of wheat that we imported, either in the form of grain or flour, the United States of America sent us 55 per cent., Canada 10 per cent., Argentine 8 per cent., Russia 10 per cent., and the remaining 17 per cent. came to us from other countries.

The average yield in England per statute acre is about 30 bushels, in Scotland 39, and from the virgin soil of Canada and America about 15 bushels.

Forty bushels per acre is a heavy crop in this country. Under exceptional circumstances, on good soil, by skill in manuring and treatment

of the land, and favourable weather, a few crops have been grown yielding 60 bushels to the acre. At an Agricultural College, the yield of a small experimental plot worked out at about 71 bushels to the acre and 86 cwt. of straw.

Milling.



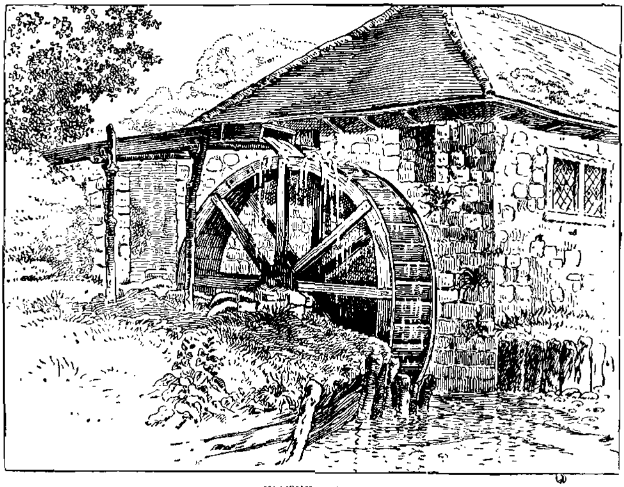
A STEAM FLOUR MILL. (MARKET DRAYTON).

If you ever get the chance, go over a modern steam mill. There is always something fascinating in watching machinery do its work.

Visit first of all the engine, which sets in motion the machinery fixed throughout the

building, and then visit in turn all the other parts of the mill and see how each part is doing the work it is intended to do.

And having seen all this, go home and think about it. If you wish to impress it upon your memory, think of it just before going



WATER MILL.

to sleep. In the mind's eye you will see how all the parts are each doing their own work, in order that the mill as a whole may carry out the scheme of the designer.

And if you go on thinking, you will understand how machinery saves labour and lessens the expense of production and manufacture. Machinery enables you to obtain food to eat,

clothes to wear, and houses to live in, at a less cost than you could obtain them if machinery had not been invented.

A modern steam flour mill seems to have reached the highest pitch of excellence; it is difficult to realise that it is mere machinery, so accurately and perfectly does it do its work.

ANALYSES OF FLOUR.

	Fine Flour.	Medium Flour.	Whole Meal.
Water,	12	13	14
Proteids (Gluten, albumen, etc.),	9	12	15
Fat,	$\frac{3}{4}$	1	$1\frac{1}{2}$
Carbo-hydrates (Starch, sugar, etc.),	77	72	66
Fibre, Mineral Matter,	$1\frac{1}{4}$	2	$3\frac{1}{2}$
	100	100	100

After the miller has bought the wheat from the farmer and the grain merchant, he has a great deal to do before he can place it in his mill to be ground into flour. He has to buy wheats that come from different countries and then to blend or mix them, so as to get them into the best condition for milling. The berries must not be too hard, or too soft, or too dry; and they must

STARCH GRAINS FROM WHEAT.

A, large; *B*, small grains magnified 540 times.

be free of all impurities, if he does not wish his flour to be tainted and of a bad colour and flavour.

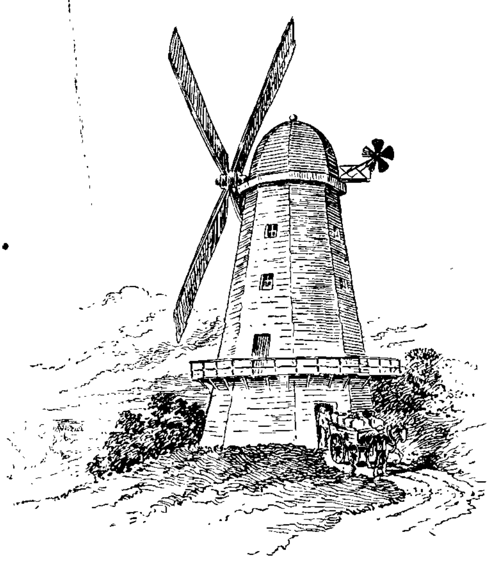
You will be surprised to hear what a number of things are mixed up with the wheat berries, which have to be cleared away,—barley, oats, maize, sticks, straw, rye, dirt, stones, sand, wire, string, nails, dust, chaff, smut balls, are a few of the impurities found in the wheat. Foreign wheats have the greatest quantity of these impurities mixed with them, while English wheats are said to be the freest from them.

Conditioning the Wheat and Turning it into Flour.

Many millers, before they mill their wheats, not only mix different qualities of wheat together, and get rid of all impurities, but they condition them. That is, they get them into just that state of ripeness and moisture, that in their opinion makes the best and most profitable flour.

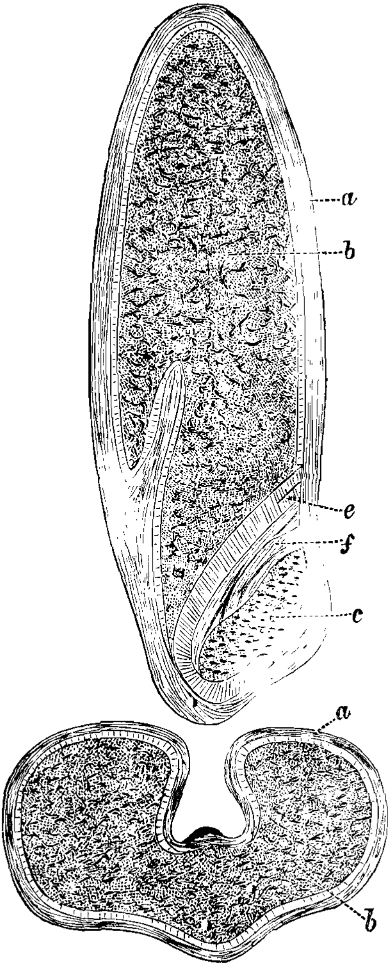
Sometimes millers will even wash and dry their wheats. Sometimes when their wheats are in a soft and unripe condition, they will apply heat in order to ripen them. They will try to do by artificial means what the sun should have done.

The miller sometimes finds that the hard varieties are too hard, and the soft varieties too soft to yield that quality of strong gluten, which is an absolute necessity if the best loaf of bread is to be made. So to correct these faults, a few days before they mill, they mix the harder and



WINDMILL.

drier varieties of wheat with the softer and moister varieties. They do this so that the harder varieties may take up some of the moisture from the softer varieties, and thus become less hard, and the moister varieties yield up



LONGITUDINAL AND TRANSVERSE SECTIONS OF WHEAT. (Multiplied 15 diameters.)

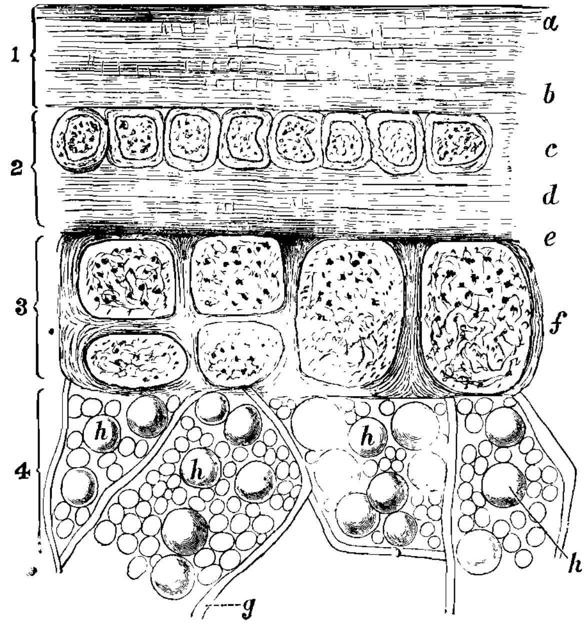
a, Bran; *b*, endosperm; *c*, germ; *e*, secretory epithelium; *f*, scutellum.

some of their moisture, and thus become less moist. In other words, the soft wheat is made harder and riper, and the hard wheat is made softer and more mellow, and the whole of this work is done in order that the best loaf may be made by the baker, and a profit may be made by the miller.

The actual process, in a modern steam mill, of turning wheat into flour is far too complicated to give you here even

the barest outline. It would require a book all to itself.

Roughly speaking, the wheat is poured into



SECTION OF BRAN.

1. External Coat—*a*, epidermis; *b*, epicarp. 2. Middle Coat—*c*, endocarp; *d*, episperm. 3. Internal Coat—*e*, membrane; *f*, cereal in cells. 4. Endosperm—*g*, wall of cellulose cell; *h*, starch grains.

the receptacles or bins at the top of the mill, and then by a system of breaking, grinding, shaking, fanning, and sifting, the grains of wheat are divided as follows—beginning from

the outside of the grain—bran, pollards, sharps, first, second, and third flours, and separated from all this, collected together, are little tiny yellow specks, the Germs of the grain.

Superfine flour, which gives to bread its extreme whiteness, has all the branny or coarser parts and the Germ of the grain taken from it, and feels and looks like the purest chalk.

It is thought that this very superfine flour, with all the coarser parts of the grain and Germ taken out of it, is not so nourishing as the flour that retains some of the coarser or branny parts of the grain, and all of the Germ.

An old established and successful London baker writes as follows: "English millers of late have been seized with an insane desire to obtain in their flour, at all costs, an unnatural whiteness To this whiteness is sacrificed flavour, moisture, and nutriment. The flour is dressed and dressed, sifted and sifted, until only a little dry, tasteless flour remains, utterly incapable of sustaining life, and still less of rearing men, or healthy children."

The Old and New Method of Milling.

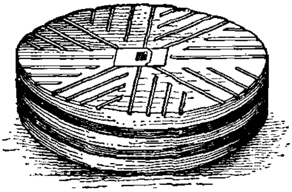
There are two methods of grinding wheat.

1. The old method of grinding wheat between two stones.

2. The modern method of grinding wheat

between chilled iron rollers, which rotate on their own axis towards each other, the wheat being crushed, or broken, at the point where the rollers are closest in contact, each rotating towards the other, both rollers being driven at a high speed.

1. By the old method, that is when the wheat is ground between stones, a certain proportion of the branny particles and the Germ are ground up with the flour, almost as fine as the flour itself. If you take up a small quantity of flour ground between stones, by the old-fashioned method, and rub it between your finger and thumb, it will feel gritty to the touch, or as the baker expresses it, it has some tooth in it. This gritty feeling is caused by the presence of some of the branny particles, which have not been sifted out of the flour.


MILL-STONE DRESSED READY FOR GRINDING.

2. By the modern method of grinding between rollers, and extreme sifting, all the branny parts of the wheat and the Germ are taken out of the flour.

If you take between your finger and thumb a small quantity of superfine flour, which has been ground by the modern method, it will look and

feel like the finest and whitest chalk. You can feel no grit in it.

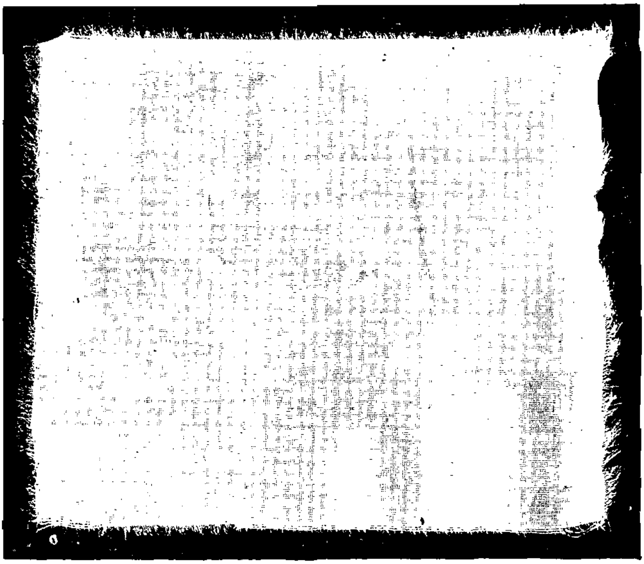
The foremost millers and bakers in London all seem to agree, that the bread made from flour milled between stones, where a proportion of the Branny particles and the Germ is retained in the flour, makes the more nourishing, wholesome, and palatable loaf of bread.

It is the Branny particles and the Germ in the bread that keep the loaf moist. If the Germ and Branny particles are eliminated, as they are in superfine flour milled between iron rollers, the loaf will in a day or two become quite dry and tasteless. It is the Germ milled in the flour that gives the loaf of bread its sweet nutty flavour.

It is also stated—that the Branny particles contain Phosphate of Lime, and it is phosphates that make good muscle and hard bone. It is also claimed for the Germ that it is the most nutritious part of the Grain.

One authority states the case like this—English wheat used to be ground between stones, and the Germ and a proportion of the Bran was left in the flour. The process now is—to crush the wheat between steel rollers and then pass it through a fine Mesh, which removes from the flour all the Germ and Bran, and most of the earthy salts, leaving little else but starch and Gluten.

In the Modern Steam Roller Mill, the wheat berry passes through no less than ten sets of rollers before it reaches the state of superfine flour. The first four stages, known as the 1st,



FACSIMILE REPRODUCTION OF A PORTION OF THE MESH USED IN THE SIEVES OF A MODERN MILL.

2nd, 3rd, and 4th breaks, take from the berry all of the outside covering or bran. The remaining six stages, in each of which the berry is gradually broken between smooth chilled-iron rollers, reduces it to the state of superfine flour.

The illustration, here given, is an exact facsimile reproduction of a portion of one of the

meshes or sieves, through which the superfine flour is sifted. Seeing this mesh it can be readily understood, that only the finest and driest portions of the ground wheat berry can pass through the sieve. This means that the more starchy portions pass through the sieve as flour, and that the Germ and Branny particles, the more nourishing portion of the wheat berry, being unable to pass through the sieve, are carried off into the offal or pollards.

You will now, and very rightly, ask this question. If men, women, and children are to get as much strength as possible out of a loaf of bread, how ought that loaf to be made?

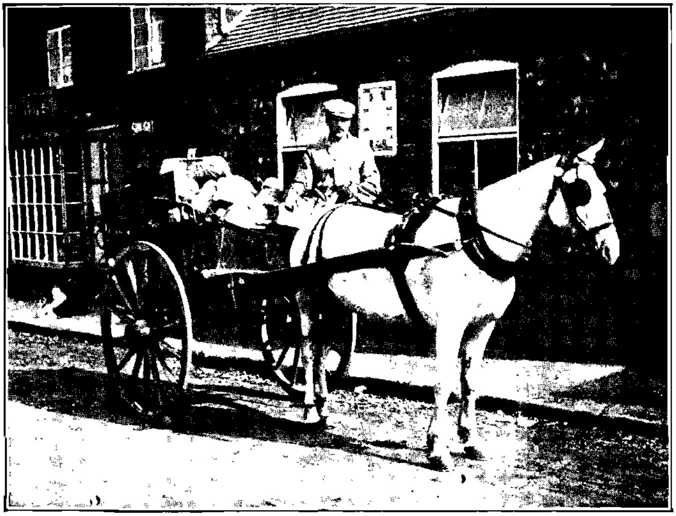
After very careful thought and examination, the writer is inclined to agree with those authorities who state that the best loaf is made as follows: 50 or 60 per cent. of good quality dry English wheat, mixed with 40 or 50 per cent. of the dry imported wheats, the whole, and this is the important point, ground between stones and not between rollers. Or if ground between rollers, then the Germ and all the Branny parts of the Germ must not be eliminated by the process of milling.

A large London baker since he has baked from flour milled between stones, instead of between rollers (a large proportion of the flour being from English wheat), says he has made a bread of

better appearance and sweeter flavour, and that he has now no complaints of the bread drying up.

Home-Made Bread.

In the olden days when the roads, especially the by-roads, were not so good as they are



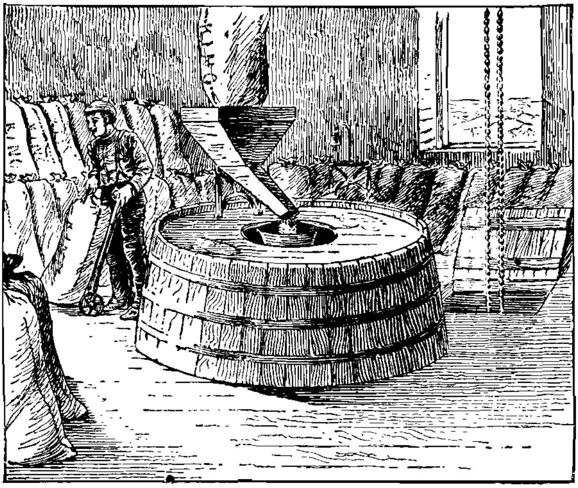
THE BAKER'S CART.

to-day, and the communications between the villages and towns not so frequent, or so easy, bakers' carts did not call at every cottage, farm-house and hall, as they do to-day.

In consequence those who lived in the country were compelled to bake their own bread. The farmers sent a quantity of their own wheat,

sufficient for the week's baking, to the nearest country mill. In these mills, driven either by wind or water, the wheat was milled between stones into a golden-tinted flour.

The flour thus milled was returned in the same sacks in which the farmer had sent his wheat,



INTERIOR OF A MILL.
The stones grinding the corn are enclosed in what looks like half of a large barrel, in the centre of the picture.

and with this flour a sufficient supply of bread was baked once a week to supply his family, guests, servants, and any of the working farm hands, who in those days lodged more frequently in the house than they do to-day. The miller in most cases kept back the bran as payment for milling the flour.

The flour ground by those old-fashioned mills was not so white and superfine, or so smooth to the touch, as the flour ground by the modern steam mill.

But owing to the flour, milled in those old-fashioned mills, retaining some of its Branny particles and all of the Germ, it was more strengthening, more nourishing, more bone-forming and muscle-hardening, and a better preserver of the teeth than the beautiful looking flour now milled.

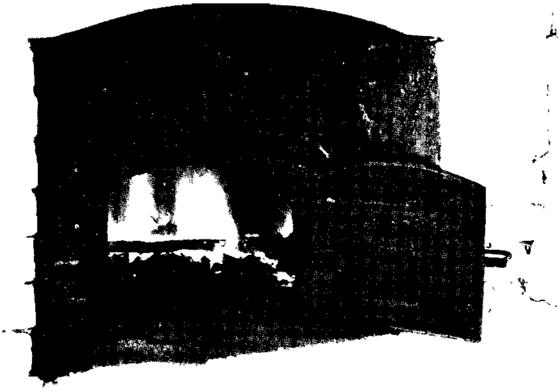
Bread baked at home (if baked well), was then more nearly the staff of life, than the bread made to-day, with the flour from which every trace of Bran and Germ is removed.

It may be true, what practical millers and bakers say, that as we and our children eat so much more meat and other supporting foods than our forefathers did, there is not the same necessity for such a sustaining loaf of bread.

The fact however remains, that the well-baked farm and cottage loaf is a sweeter and more sustaining article of food, than the loaf that is made with flour milled in a modern steam mill, and baked in the oven of a modern bakery.

In the olden days no mansion, farm house, or cottage was ever built without a brick oven in which to bake the week's supply of bread. Now the baker's cart has done away with most of this,

and a modern country dwelling-place is seldom built with a brick oven for baking purposes. The old brick ovens, that used to turn out such sweet-smelling crusty loaves of bread, are mostly lying idle, and are dark, dingy places, relics of a



A BRICK OVEN.

When the oven is heated, and the fire has burned clear, the hot, or live ashes are withdrawn, and the oven swept with a long-handled broom which has been damped (to prevent it burning). The shaped dough is then placed in the oven with a peel (like a long-handled wooden spade), and takes about two hours to bake.

past state of life. Here and there, however, are still to be found households, with a wise and hard-working wife and mother at the head, which still bake their own bread. They still buy the flour from the miller, and once a week turn it into bread.

A Tenant Farmer's Receipt for Home-made Bread.

To make 60 lbs. of dough, 42 lbs. of flour, 15 pints of water at a temperature of 98 degrees, 4 oz. of salt, and 5 oz. of yeast are required. When this is baked its weight is about 52 lbs. of bread.

The flour is placed in the kneading trough, and the salt taken between the finger and thumb and sprinkled over the flour. A shallow hole is then made in the centre of the flour, and into this hole is poured about three parts of the water.

The yeast is dissolved in the remainder of the water, and then added to the flour.

The whole is then stirred with a spoon until the flour, yeast, salt, and water are thoroughly mixed, a sprinkling of fresh flour being added at the same time.

The lid is then placed on the kneading trough to allow the dough to rise. The rising takes half an hour.

The lid of the trough is then removed, and the dough is again well mixed and kneaded, until it becomes quite smooth. When this is done, replace the lid on the trough and keep the dough quite warm until the oven is hot.

The brick oven is heated by a wood fire, and when the oven is sufficiently hot to receive the dough, the bricks look white all over. The

ashes are then withdrawn, and the oven is carefully swept out.

While the oven is being swept out, the dough is shaped into the loaves of bread. The loaves take about two hours to bake.

HOME-BAKED BREAD.

The quantity of flour named makes thirteen quartern loaves, a liberal allowance of bread for one week for a family of eight.

As regards the cost, taking the value of everything into consideration, a 4 lb. loaf cost 3¾d., at the time the baker's quartern loaf was selling for 5d. The saving, therefore, to the farmer by baking his own bread, instead of buying it from the baker, was 1s. 6d. per week.

The flour used is second flour, that is a flour that is not so refined or white as the first flour.

THE OAT CROP.

TAKING the average yield, and the present market prices of the grain crops, it is clear that the most profitable of them all is the Oat Crop. The reason for this is its abundant yield, and because the straw when chopped into chaff, and mixed with other feeding stuffs, makes such an excellent food for stock. Oats will grow on almost any variety of land.

The Crop is generally sown in the Spring. After the opening of the year, no chance should be lost of getting on the land to prepare a fitting Seed Bed. The Oat plant is a very robust one, so there is not the same imperative need to prepare such a very fine Tilth or Seed Bed, as there is for the other straw crops. If the surface of the Seed Bed is a little coarse, future harrowing and rolling may correct this. It is best, however, to lose no opportunity of making a suitable Seed Bed at the start, and not to trust to future operations to correct the deficiency.

At the same time it must not be forgotten,

BLACK TARTARIAN OAT.
Close headed. ($\frac{2}{3}$ nat. size.)

WHITE CANADIAN OAT.
Open headed. ($\frac{2}{3}$ nat. size.)

that owing to the uncertain weather at the beginning of the year, it may be impossible to prepare a suitable and early Seed Bed. The only alternative is to use your judgment, seize your opportunity, and do the best that the weather will allow you to do.

As you have read before it is ruinous to work some lands, especially the heavier lands, when they are too wet to work, or the higher lands when they are too dry. The land, if you are to succeed with it, must be watched and tended with the same care and wisdom as you would tend and watch your most valuable Live Stock.

The strong keen winds of Spring often dry up much of the moisture of the lighter land, therefore, for this reason, this variety of land is often sown with Oats during the Autumn.

If the crop is sown in the Autumn the seeds should be sown early, so that they may become established before the frosts begin.

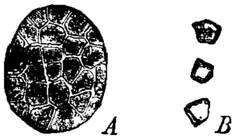
Other conditions being equal, the earlier a crop is sown the larger is its yield.

Owing to the heavy yield of oats, which is due largely to the number of grains in the ear, it is important that the straw should be very strong.

If the straw is weak and the ear heavy, a downpour of steady rain, or a light rain before a

strong wind, which often takes place when the grain is ripening, will lay the crop low, sometimes as flat as a pancake. If the crop does not grow erect again, which a heavy crop when nearly ripe seldom does, there will be a loss in yield, and the crop will probably have to be cut with the scythe instead of by the self-binder, which of course means extra expense and time in harvesting the crop.

There are now established and on the market, some varieties of Oats that combine an abundant yield with a strong and nourishing straw. But a variety that may suit one district may not suit another district. Conditions vary so much in different parts of the country, and often even on the same farm the variety of oat that does well in one field will not do well in the field adjoining it. So that it is often misleading to lay down a universal rule as to which variety of the crop it is the best to grow.



STARCH GRAINS OF THE OAT.
A, compound grains; *B*, isolated grains. (Magnified 540 times.)

Every Farmer ought to be guided largely by his own earlier training, the experience he has learnt of the capabilities of his farm, the experiments he has made on his own account, the experience and experiments of his neighbours, and by the scientific experiments made at the

nearest Agricultural College or Experimental Station.

These facts are however beyond dispute. A change of seed from a district, where climate and soil are slightly different, often produces a healthier and more abundant yielding crop. As animals thrive better with change of pasture, and we derive benefit from change of food, so seeds will grow strong with a change of soil.

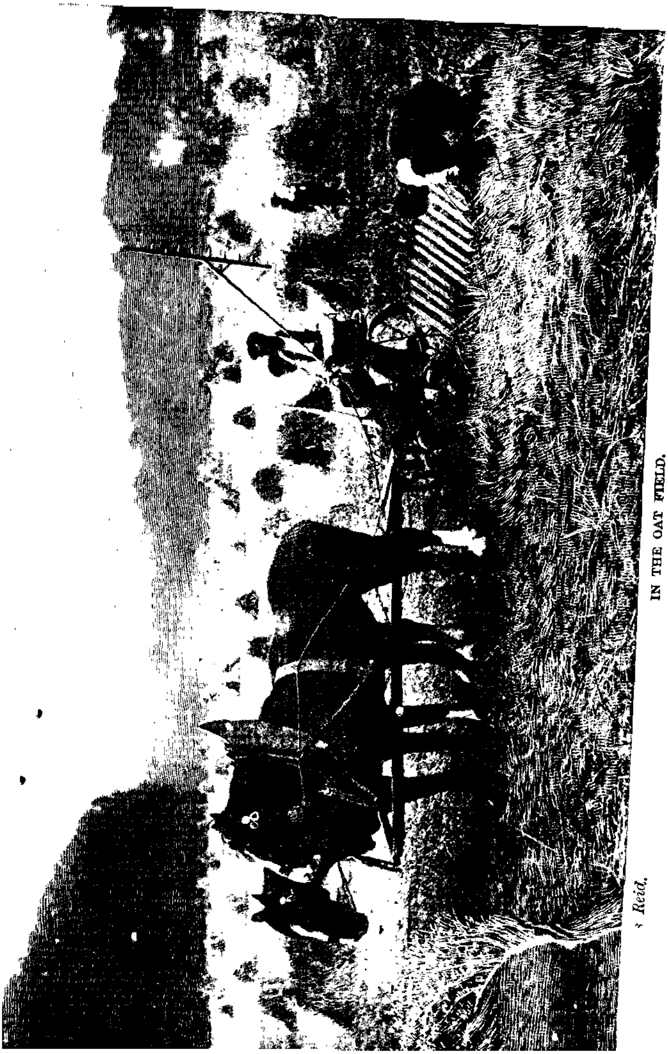
The seeds of every crop, whether it be straw, grass and clover, or roots, must not only be clean and of a high germinating power, but they must be vigorous, so that when sown they will make rapid and strong growth.

You may sow seeds the majority of which will take root and grow, but if the plants are weakly and do not grow with vigour and rapidity, the crops will not be able to withstand the attacks of insects, or the stress of inclement weather.

The average yield of Oats to the acre is 45 bushels, but with the land well cultivated and wisely manured, and given suitable varieties, it is not uncommon to obtain 60 and 65 Bushels to the acre. The writer himself examined a crop of Oats that thrashed out at 88 Bushels to the acre.

Harvesting Oats.

Oats ought to be cut when the grain is fairly filled, before they are quite ripe. That is, when



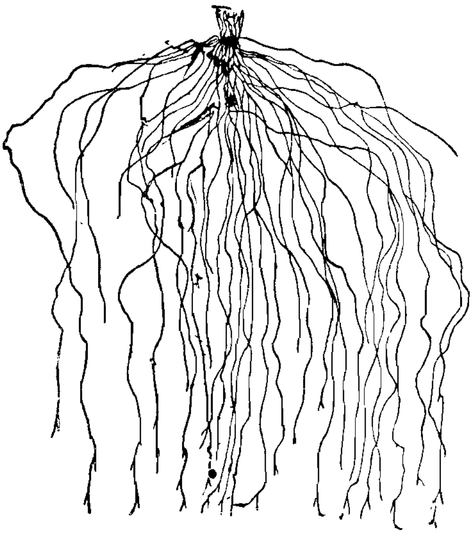
IN THE OAT FIELD.

Reid.

there is a slight yellow tinge throughout the field, although the straw below the ear is still green.

The Crop is cut, sheaved, and stooked very much in the same way as wheat.

Oats when cut retain their moisture for a longer period than wheat, therefore they take a longer time to dry. If stacked in a wet condition the grain will ferment. You can tell fermented oats by their browner skins, and when given to cattle they are often very injurious.

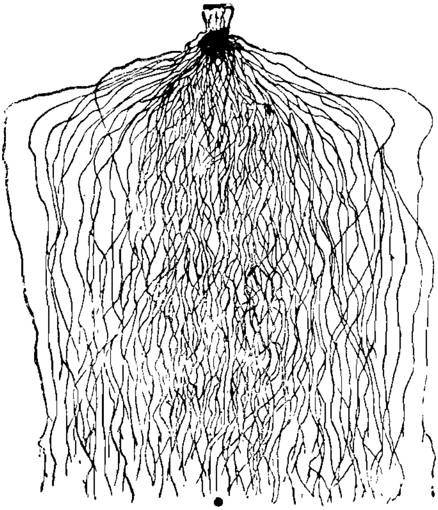


ROOT OF THE OAT.
Compare with the illustration on page 94.

The Oat Straw is very useful as a fodder, especially when chopped by the Chaff cutter and mixed with other feeding stuffs.

animals there is probably no single food 'Oats oushing, 'which will keep them in such filled, befoth, as heavy, thin-skinned, old Oats,—

Oats that are bright, clean, and thin in their husk or outer covering. There is no feed known to beat good old Oats for horses, that are called upon to do work necessitating endurance or staying power. In order to make the Oats digestible and cause them to yield the greatest amount of nourishment, they are crushed or rolled, and mixed with good hay chaff and a handful or two of Bran, and the whole mixture damped with a little water.



ROOT OF IMPROVED BREED OF OAT.

Grown by Messrs. Gartons; note the very large increase of the root area.

Oats ought to be at least a year old before they are given to valuable horses. Feeding horses on new oats is often injurious. The whole oat milled into a flour is a good food for fattening poultry, especially when mixed with skimmed or separated milk.

THE BARLEY CROP.

Of all the straw crops Barley is the most difficult to grow. The great object in growing Barley is to harvest uniform grains fit for the Maltster. For brewing the Maltster requires hard grain of a light straw colour, the skin of which should be wrinkled into a fine net work.

If the skin is smooth and contains colour, it will not attain that clear, light shade which is so necessary for a perfect malting sample.

If the grain is not suitable for malting, it has to be ground into Barley meal and given as food to stock; in this case the crop is not so valuable.

To produce a fine malting sample care must be exercised to procure a deep, mellow, Seed Bed, and the crop must be cut and stacked under suitable conditions.

The Seed Bed.

Barley and Oats are generally sown in the Spring, therefore in order to allow a good Seed Bed to be made, they generally follow a fallow or the root crops.

Barley is best sown when the Seed Bed is sufficiently deep to cover the Seeds and the soil fairly light and compact, so as to afford an efficient root hold for the plants.

When the land works badly, so that the fine tilth so necessary for Barley cannot be obtained, it is advisable to sow oats, a crop which does not require such a fine seed bed.

Barley is what is termed a surface feeder and therefore it is seeded in a light soil, which must be in a fine state of subdivision and contain an ample supply of available food.

Barley being planted in the Spring has only a short period for root development, therefore it must find its nourishment within a short distance of the surface of the soil.

Winter Wheat, on the other hand, is sown in the Autumn, and being a deep-rooted plant has four or five months to spread its roots, and therefore takes possession of a wider range of soil. In consequence there is not the same imperative need to prepare such a perfect seed bed for Wheat as for Barley.

Barley for malting requires more careful cultivation than any other cereal crop—and if the land is not exactly suitable and the cultivator has not had considerable previous experience, he had better not attempt the Barley Crop.

If a uniform sample of a good colour is to be

obtained at Harvest time, great care must be taken with the crop at all stages of its growth, from the planting of the seed to the thrashing out of the grain into the sacks.

If the growth of this crop is too rapid, it will yield a coarse, uneven sample of grain, unsuitable for malting purposes.

CHEVALIER BARLEY. Two Rowed. ($\frac{2}{3}$ nat. size.)

Harvesting Barley.

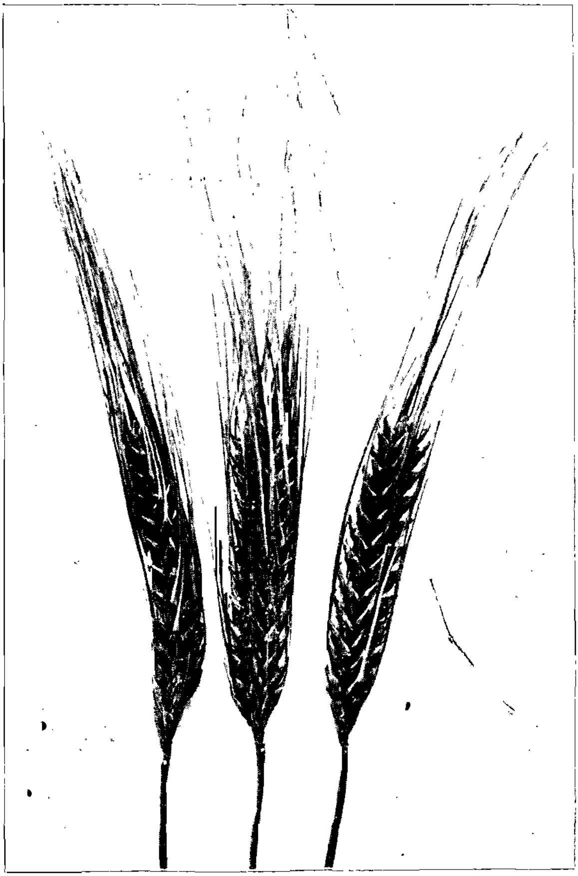
Unlike Wheat and Oats, Barley must not be cut until it is fully ripe. The whole crop should look white and the ear should hang on one side, sickle-headed, a term used to denote that the ear has curved downwards. When the weather permits, the whole crop should be exposed to alternate sunshine and light rain for two or three days after cutting; this causes the grain to become more mellow, lightens its colour, and makes the skin wrinkle into a fine network over the surface of the grain.

Barley is fit to stack much sooner when it is carted loosely, than when it is bound in sheaves. There is no fixed rule as to tying or not tying Barley into sheaves.

Most farmers now, owing to the scarcity of labour, use the Self-Binder instead of the Scythe. But the Scythe is the best implement for cutting Barley.

If you have crops of Wheat, Oats, and Barley standing out in the open waiting to be carried, the Oats and Wheat must wait till the Barley is carried, because Barley is much more liable to be spoilt by the weather than either Oats or Wheat.

The straw of Barley is much softer or flaggy than the straw of Oats and Wheat. Owing to the flaggy or soft nature of Barley straw the



"ZERO" SIX ROW BARLEY. ($\frac{2}{3}$ nat. size.)

Very early, quality medium, grain large and plump, straw long and strong. The hardiest of any known cereal. Is better than Rye as a green crop, being more nutritious and palatable.

stack must be thatched at once, so that the rain may drain from the roof, instead of

soaking into the stack. If the rain soaks into the stack it causes much damage to the grain.

If the best price is to be obtained for the crop, that is if a good malting sample, possessing a light skin and a wrinkled surface, is to be obtained, care must be taken in threshing the grain out of the ears, and care must also be taken that no inferior or weathered barley is mixed with the better grain, otherwise the bulk will be judged by the inferior grain mixed with the better grain, and so the whole bulk will fetch, in the market, several shillings per quarter less than it would otherwise do.

BEARDLESS BARLEY. (⅝ nat. size.)

The average yield in this country is between 30 and 35 bushels to the statute acre.

GROWING THE ROOT CROP.

The object of the Root Crop is to supply the Dairy Stock, the Feeding Stock, and the Sheep with a cooling, succulent food when no grass or green food can be obtained.

In the winter most of the Stock has to be housed and fed on dry food, such as Hay, Cut Straw mixed with the meal milled from the Cereals, and Linseed, Cotton, (decorticated and undecorticated), or Rape Cakes. The roots are mostly cut up and mixed with the dry food, and this mixture supplies the animals with moist, nourishing, and appetising food, and at the same time keeps them healthy and strong.

The food-stuffs used on the Farm fall naturally into three classes.

(1) Succulent Foods, namely, Pasture Grass, Clovers, and the Root and Cabbage Crops. The Root Crop includes the Mangel Wurzel, Turnips, Swedes, and Carrots, etc. The Cabbage Family includes the common Ox Cabbage, the Thousand-headed Kale, and Kohl Rabi.

(2) Dry Foods include Clover and Meadow Hay, Cut Straw, and Meal milled from the

different grains, called respectively Wheat Meal, Barley Meal, Oat Meal, Crushed Oats, and Maize Meal. These foods, excepting Maize, can be grown and prepared on the Farm.

(3) Purchased Foods include Linseed Cake, Cotton Cake, etc., Brewer's Grains, Malt Dust, and Maize.

The Root Crop is a very expensive crop to grow and it is a problem, for the future to solve, whether the cost is repaid by the result, and whether some other crop could not be grown, giving equally good results, at a considerably less cost.

But there is this important point to be taken into consideration, namely, the well-being of the land, because in preparing the land for a Root Crop comes the only chance, in the succession of crops, of thoroughly clearing the land from weeds and rubbish, and of exposing it for a time to the beneficial effects of the weather; and, moreover, in preparing the Seed Bed for the Root Crop, you must thoroughly work the land and manure it in a skilful manner.

Seed Bed for the Root Crop.

All practical farmers tell us that the success of the crop depends on the making of a suitable Seed Bed. Cultivation and yield go hand in hand. Nothing in the whole work of Farm-

ing requires more knowledge and experience. As you have before read, so many items have to be taken into consideration, the composition of the soil, whether light or heavy; subsoil; its drainage; how it lies to the sun and wind;

YELLOW INTERMEDIATE CARROT.
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the climatic conditions of the neighbourhood; its present condition, and its past history. And these all very much depend on the Seasons. If the Fall is wet, the heavier lands cannot be worked; if the Spring is dry and the winds high, the lighter lands dry up like a hard road. The indispensable teacher of good farming is experience;

without experience, theory and all the business training in the world will not bring success. The ideal farmer ought to combine theory directed by experience, worked by business methods and along business lines. In one word, he must be a thinking man—an experienced, active man, and a business man.

The root crop generally follows a grain crop, usually a wheat crop. If the weather permits, as soon as the grain crop is harvested and the men and horses are at liberty, the stubble should be worked—that is, the stubble should be broken up. The practice of doing this varies, but the best plan is to use the plough. The plough brings the weeds and their seeds to the surface, and the plough also turns up and exposes insects, their eggs and chrysalises, and the buried seeds of weeds, to the keen eye of the Peewit, Rook, and Wood Pigeon and the insect-eating birds, and the plough also turns up and exposes a body of under surface soil to the healthy influences of the rain, wind, frost, and snow.

As soon as possible the land should be cleared of rubbish, undergrowth, and the surface roots of weeds, and especially that terrible pest, when it gets hold of land—"The Couch Grass." In many parts of the country Couch Grass is called Twitch; in other parts the Black Bent or Hunger Weed is called Twitch. But the weed that gets hold

of the plough land, sucks up the moisture, and consumes the plant food, is the Couch Grass. By means of its underground stems it forms a labyrinth of roots, spreading out on all sides, just

MAMMOTH LONG RED MANGEL.
Root grows from 6 to 40 lbs. in weight. Heavier specimens are common.
Copyright, Sutton & Sons.

under the surface of the ground. When once established no crop has a chance against it.

It is the practice of many farmers, especially those who farm the heavier soils, to get their Manure on to the land in the Autumn, because they think there is less loss of Manurial value when it decays in the soil, than when it rots in

the Dung Heap. So these farmers empty their manure yards on to their arable land in the Autumn, the bulk of it going on to the land which has been set aside for the Root Crop.

It must also be taken into consideration, that by applying the Manure to the land before it is quite rotten it does not lose so much in bulk, and this is an important fact, especially for the heavier lands, because bulk lightens these lands and renders them warmer, and therefore more suitable for plant life to thrive in.

Moreover, although the bulk of freshly made manure, when first placed on the land, is not in a suitable state of combination for the crops to feed on, by proper cultivation and working a portion of it will probably have entered into the rightful combinations, in time for the young Root plants to feed on when they need it.

If the Dung is applied in the Spring, it must be placed on the land in a rotten condition, because it is only when in this condition that the plant food is in a suitable combination, or available. And as in the first part of the year the young Root plants appear above ground, it is then that they especially require a good store of easily available food.

Land is best cleaned in dry weather, because if it is worked in wet weather it tends to puddle, which means it dries in hard clods, and when

these clods are reduced by the roller or harrow they do not fall into soft mellow loam, but into small angular particles, which have not the power of retaining moisture during the dry periods. If the land is ploughed, cultivated, and manured in the Autumn, there is a much better chance of securing a deep mellow tilth the following Spring, a condition so necessary to grow a paying Root Crop.

The Root Crop.

The Root Crop consists of Mangels, Swedes, and Turnips. This crop is also called a Fallow Crop, because it is not sown till late in the Spring, and this allows the land several months of rest from the time that the last crop was harvested, during the previous Autumn.

The Root Crop is grown for the sake of the globe-like root. These roots are cultivated and mixed with dry food, to make a Winter feed for Sheep and Cattle.

Swedes are more hardy and more nutritious than turnips, and can be distinguished, when growing, by their smoother leaves of a more bluish tint than the leaves of the turnip.

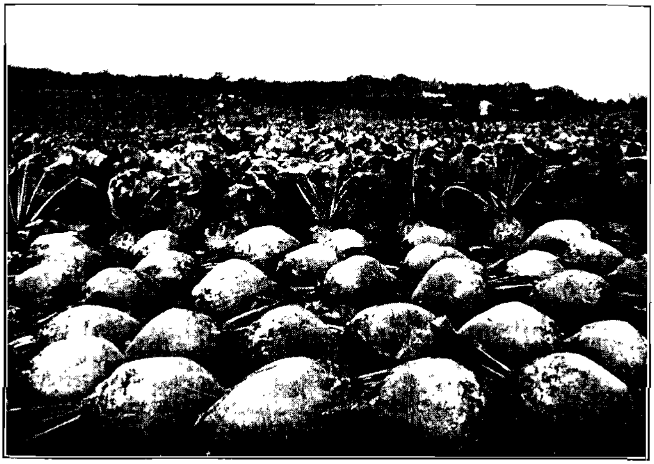
The Swede has at its crown (the top of the root), a neck from which the leaves spring, whereas the leaves of the Turnip grow more directly out of the root itself.

The wet lodging on the crown of the Turnip, especially during frosty weather, often splits the root and causes damage, which it cannot do in the case of the Swede.

IMPERIAL GREEN GLOBE TURNIP.
Root grows from 3 to 6 lbs. in weight. Heavier specimens are common.
Copyright, Sutton & Sons.

Turnips are often grown on headlands, or waste pieces of ground, and sometimes as catch crops,—catch crops being crops that are grown between rotation crops, or in the place of crops that have failed.

Everyone knows the bright glossy leaf of the Mangel, with its large flesh-coloured root. This crop has been growing in favour, because varieties are being introduced, that contain better feeding and keeping properties than the old-



PRIZE-WINNER YELLOW GLOBE MANGEL.
Root grows from 10 to 40 lbs. in weight. Heavier specimens are common.
Copyright, Sutton & Sons.

fashioned varieties. The Mangel, the Sugar Beet, and the garden beet, or Beet-Root, are all improvements, produced by selection and cultivation, of the same original wild plant that can be found growing on the sea shores. The garden beet you all know—the sugar beet is cultivated largely in Germany, Austria, and France. Beet Sugar is extracted from the roots of the sugar

beet, and the pulp that is left after the sugar is extracted is used as a food for cattle, and a very valuable food it is. Experiments prove that the sugar beet can be cultivated in this country.

The writer's experience tells him that the sugar extracted from the sugar cane is sweeter than the sugar extracted from the beet—the sugar from the cane is certainly a little dearer, but for sweetening purposes it goes further, and is probably cheaper.

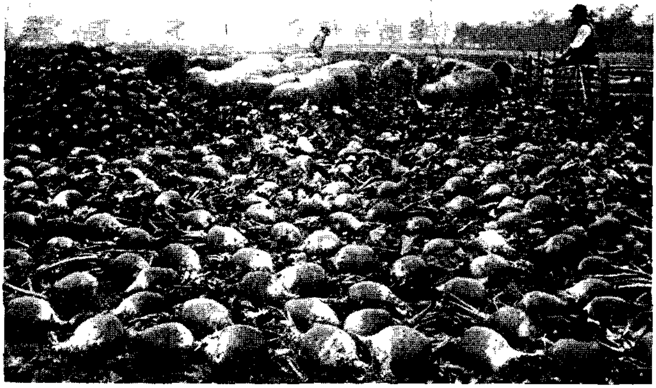
A most important fact has been discovered of late, namely, if the land is infected with a disease called Finger-and-Toe—a disease which affects Swedes, the Cabbage family, and Turnips, —that if instead of planting Swedes, Turnips, or Cabbage in the rotation, you plant Mangels, they will clear the land of the disease germs.

On the heavier lands, in the dairy districts, the Mangels are grown to a large size. When they are lifted, or pulled up, in the Autumn, in order to keep them they are stored in pits or clamps, and taken out and carted to the pulping house as required.

On the chalky or lighter soil, land most suitable for rearing sheep, turnips of a smaller size are grown, and in the Autumn they are fed off by sheep which are penned on them.

The botanists tell us that the Mangel is, in

relationship, far removed from the Swede, but the modern varieties of the Mangel equal the Swede as a food, and they beat it in the length of time that they will keep.



MAGNUM BONUM SWEDE.
Root grows from 5 to 12 lbs. in weight. Heavier specimens are common.
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The Mangel is sown earlier than the Swede or Turnip, and it takes a longer time to grow; its tap root grows much deeper into the ground, and it exposes a much wider surface of leaf to the atmosphere. On account of its extended root range it requires less rain and more warmth than the Turnip. Therefore it is seldom grown in the North of England, or in Scotland. It is prin-

cipally grown in the Midland, Eastern, and Southern Districts, and when the soil is suitable and well made farm manure has been skilfully applied to the seed bed, it grows a much larger

THOUSAND-HEADED KALE.
Copyright, Sutton & Sons.

crop to the acre than the turnip family. It is specially useful as a food for milking cows when mixed with chaff and meal.

Cabbage Family.

To the cabbage family belong the cabbages grown in the garden and the following varieties

grown for the purpose of feed for the stock, namely the Drumhead Cabbage, Thousand-headed Kale, and the Kohl Rabi.

This family of plants are, if anything, more valuable as winter feeding stuff than the turnip family. They are not so liable to disease and

DRUMHEAD CABBAGE.
Grows from 20 to 40 lbs. in weight. Much heavier specimens are common.
Copyright, Sutton & Sons.

they are less affected by drought and frost. They are very nutritious, and very rarely—when given in moderation—upset the health of young animals.

If the young plants of the cabbage family are raised in seed beds and transplanted, a supply of green fodder, suitable for stock, can be obtained

throughout the year. The cabbage family thrives best on the heavier lands.

The Drumhead Cabbage forms a compact head, or heart, owing to the dense overlapping of its leaves; the Thousand-headed Kale on the other hand consists of long, upright branching stems, which develop numerous leaves or sprouts, but its straggling habit prevents it forming any heart.

The Kohl Rabi looks like a root above ground, and has been called a turnip rooted cabbage.

A Profitable Root.

A profitable Root is a Root that is individually large in size, or bulk, and which yields a heavy crop to the acre, a Root that contains a sufficient amount and yet not an excess of water, the juice of which is rich, or dense, in sugar or feeding properties.

If a Root contains too much water, the juice and fibre is lessened in that proportion.

If the Stock take in too much water in their food at a low temperature, especially during the winter, you are not making the most profitable use of the food, and therefore of the stock.

Many up-to-date farmers during the winter months, are now warming the water before allowing the cattle to drink.

The larger proportion of all Roots is water; the smaller proportion being juice and fibre.

KOHL RABI.

Grows from 5 to 15 lbs. in weight. Heavier specimens are common.

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The great object in growing a Root is, while retaining its bulk and yield, to lessen the watery portion and to increase the richness, or density, of the feeding properties of its juices.

In growing Roots there is another important point to be taken into consideration, namely, to sow a crop or variety that has the strength and hardihood to resist the attacks of Fly, Mildew, Finger-and-Toe, and other diseases.

Our principal Seedsmen have grasped, and are working out the world-wide principle that Darwin pointed out, namely, Selection. By Selection they have produced Breeds of Roots that are large in Bulk, with less water and denser juices, which are therefore of much more feeding value than the roots grown a few years ago.

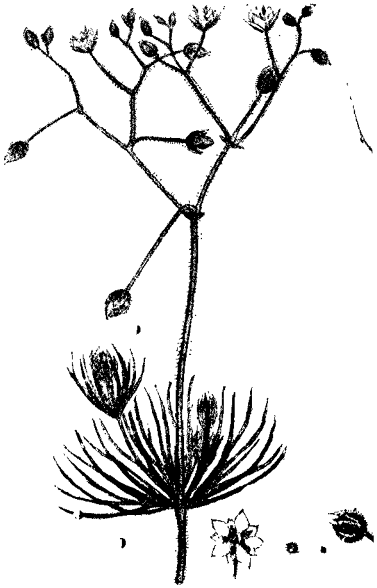
In fact these Seedsmen are now offering seeds for sale, the crop from which contains as much solid food in five tons, as was formerly grown in ten tons.

WEEDS OF THE PLOUGH LAND.

ONE day the writer was talking to the children of the village school about the grasses and wild flowers, which at that time of the year were growing and flowering in the hedges and the fields.

The children, as was their custom on their way to school, had picked a few specimens of the grasses and wild flowers, and brought them with them to school.

Some of the specimens on being held before the class were named by the children, and at the same time they stated



SPURREY.
(*Spergula Arvensis.*) Annual.
Stems 5-18 inches. Flowers $\frac{1}{6}$-$\frac{1}{4}$ inch diameter.

whether the specimens held up were useful, or not, to the Farmer and Gardener.

At the end of a few minutes' talk, the children were asked for a definition of a weed. Up went

KNOT-GRASS. (*Polygonum Aviculare.*) Annual.
Stems $\frac{1}{2}$-3 feet. Flowers $\frac{1}{10}$-$\frac{1}{8}$ inch.

one bright-eyed boy's arm, as a signal that he had his answer ready. "Something that grows where it oughtn't to grow, sir." That sharp lad's answer can hardly be improved upon.

If you grow a crop of wheat and amongst the crop there are a number of oat plants—then the oat plants are weeds. If you grow a crop of oats and amongst the crop there are a number of wheat plants, the wheat plants are weeds.

If you grow a crop of clover and amidst the crop there also grows a number of useful fodder grasses, then these fodder grasses, occupying the

space intended for the clover plants, reduce the yield of clover, and therefore in this case we regard the useful fodder grasses as weeds.

And yet we cannot regard the useful grasses growing amidst the clover as absolute weeds, because when they are harvested with the clover they are of value for feeding.

SHEPHERD'S PURSE.
(*Capsella Bursa Pastoris.*) Annual.
Stems 6-16 inches. Flowers $\frac{1}{10}$ inch diameter.

So some authorities call cultivated plants which grow out of place Relative Weeds, and those plants possessing no apparent value to the cultivator and injurious to crops they call Absolute Weeds.

Some of the absolute weeds found in the Plough Land are Thistles, Bind Weed, Docks, Poppies, Charlock, Coltsfoot, Chickweed, Knot-grass, Shepherd's Purse, Fumitory, Ox-Eye Daisy. A more complete list will be given later on.

Why Weeds are injurious.

They occupy space, and so reduce the yield of the good crops.

When the weeds grow strong they prevent the sunlight and air from getting to the crop; this throws the crop out of shape and causes the stems to draw up and become weak, and liable to fall over.

CHICKWEED.
(*Stellaria Media.*) Annual.
Stems 6-18 inches.

Weeds not only keep off light and air, and pull down and exhaust the crop, but they also consume a great quantity of the plant food, that the crops require for their strength and health, but weeds do most harm by taking up a considerable amount of water from the soil, and transferring it to the air cause the ground to become hard and dry.

Where Weeds are present they compete for the water supply in the soil, and thus reduce the amount available for the crops. As you have previously read the Plant Food must be dissolved in water if the crops are to take it in, and if there is not sufficient moisture in the soil, the crops become stunted in their growth, and their yield is considerably reduced.

BARTSIA.
(Bartsia Odontites.) Annual.
Stems 6-18 inches.

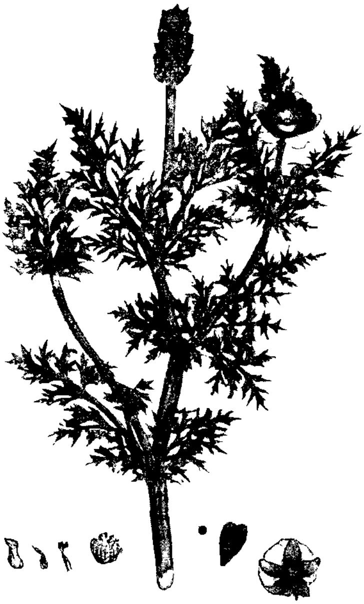
In the slow growing root crops such as Carrots and Mangels, and also with Lucerne and Sanfoin, the growth is much slower than that of the weeds, therefore the weeds, if allowed to grow unchecked, smother the young crop, which never afterwards recovers.

Rapid growing crops such as Rape and Vetches, with their wide extent of leafage, will sometimes gain the upper hand of the weeds, and thus in some degree keep them under.

Some weeds, called erect weeds, like Groundsel,

Shepherd's Purse, Charlock, and the Poppy, grow upright and straight from the soil.

Other weeds, like the Plantain, Docks, and Buttercup, creep more over the surface of the soil, and occupy wide areas which the crops ought to occupy. These prostrate weeds, as they are called, are more directly harmful than the erect weeds.



PHEASANT'S EYE.
(*Adonis Autumnalis.*) Annual.
Stems 8-10 inches.

Weeds such as the Bind-weed twine round the stems of the crop, in order to place their leaves in a favourable position to obtain light and air; in this way they weaken the crop.

Many weeds use the crops as a support but do not twine around them. Tares climb by means of tendrils. Cleavers are covered with stiff hooked hairs which enable them to climb,—in this way they pull the crops down.

A few weeds, of which the Dodder is an example, instead of taking their food from the soil and air, attach themselves to certain plants, and by sending their roots into either the stems or roots, take their food wholly or in part from the Plant attacked, their host as it is termed.

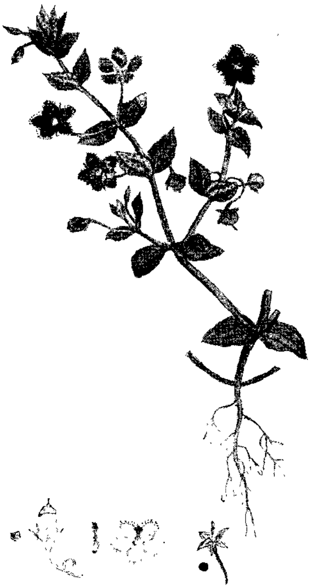
BINDWEED.
(*Convolvulus Arvensis.*) Perennial.
Stems 6-24 inches. Flowers 1 inch diameter.

The Yellow Rattle, Red Bartsia, and the Eyebright obtain their food from the roots of other plants.

You must also remember that weeds harbour and feed insects which are injurious to the crops. For instance, the Turnip Flea Beetle feeds upon Charlock and other weeds of the same family, and skips from these weeds on to the Turnip seedlings when they appear above ground.

The Bean Aphis lives on the Sow Thistle before it attacks the bean crop. Rust, Smut, and Mildew live upon various grasses, such as Couch

Grass, Yorkshire Fog, and the Brome Grasses and are transferred from these weed grasses to the useful crops when they appear above ground.



SCARLET PIMPERNELL.
(*Anagallis Arvensis.*) Annual.
Stem 6-18 inches.

The Meadow Saffron, Cowbane, and Water Hemlock are poisonous to Cattle, while the Wild Onion or Ransome, if consumed by Cattle, gives an offensive taste and smell of garlic to the milk, butter, and cheese. Much more could be written about the different characteristics of weeds, but you have read enough to show how important it is to keep all land, Hedges, and Ditches, as well as the Plough land and Grass land, free from weeds if you are to make the soil yield good results.

Life of a Weed.

Some weeds live one year and are called Annuals, other weeds live two years and are

called Biennials, others if left undisturbed live much longer periods and are called Perennials.

The Annuals grow from seed during the spring. The young plants feed and grow during the Summer and Autumn, and flower and seed. By the time the seeds are ripe, or soon after, the plant dies, so that all that is left of the parent plant in the Winter, is their off-spring, in the form of seeds.

CHARLOCK OR KILK.
(*Brassica Sinapsis.*) Annual.
Stems 1-2 feet. Flowers $\frac{1}{2}$-$\frac{3}{4}$ inch.

These Annual Weeds as a rule produce an enormous number of seeds, and if these seeds ripen and fall to the ground, the soil will be thickly sown with them.

A single Poppy plant frequently bears more than twenty flowers, and each of these flowers may produce 200 or 300 seeds.

Groundsel, Sow-thistle, Campions, and Charlock are all Annuals and produce an enormous quantity of seed. The total number of plants

that a single parent-plant is capable of producing, often amounts to several hundreds. Therefore you can understand, that if the Annuals are allowed to flower and seed unchecked, they will rapidly overrun the whole ground.

COMMON FUMITORY.
(*Fumaria Officinalis.*) Annual.
Stems 10-18 inches.

The roots of Annuals do not descend deep into the soil, but branch out in all directions near the surface of the soil. The shoots give out many leaves, and as these leaves grow fast, they tend to smother any crop that grows more slowly than they do.

Annuals increase by seeds alone, therefore the best and most effectual way of getting rid of them is to cut them down, and not allow them to flower or seed. In a growing crop this is almost impossible. In this case the best and probably the most practical plan is, before the crop is

planted, to encourage them to come up in a suitable seed bed, and when they appear well above the surface to draw them out of the ground, cut them down, or plough them under.

If this method is followed several times before the weeds have seeded, the Annuals will be greatly reduced in number, provided the land is not freshly sown by seed blown from elsewhere, or by seed deposited in the ground in the manure applied.

GROUNDSEL.
(*Senecio Vulgaris.*) Annual.
Stems 6-15 inches.

Biennial Weeds.

Biennial Weeds, as represented by the Cow Parsnip, Wild Carrot, Burdock, and some species of Thistles, take two seasons to complete their life.

Seeds placed in the ground in the Spring germinate during the first Summer, and produce a plant with a fleshy tap root and contracted stem. The leaves on this stem, during the first season, lie close to the ground and prepare a

considerable quantity of food, which is stored up in the tap root.

The parent plant rests during the succeeding Winter, and in the following Spring it feeds on the food it has stored up during the previous year, sending out shoots which bear roots and flowers. These Biennials after ripening their seeds, during the second season, die away.

SPEEDWELL.
(*Veronica Arvensis.*) Annual.
Stems 4-18 inches, branching.

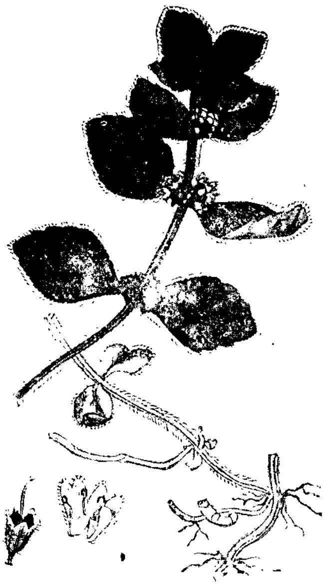
Perennial Weeds.

These plants last many years, and during their life-time they give rise to many generations of plants. They are most difficult to get rid of because they increase not only by means of seeds, but also by creeping along the surface of the ground, or just under the ground. These creeping stems, underground or above ground, root here and there and become individual plants.

These offshoots repeat the process of the

parent plant, till the whole land becomes a perfect network of their growth.

The Couch Grass, Corn Mint, Lesser Bind-weed, and others grow by means of underground stems, and here and there work their way through the soil, producing stems with leaves and flowers upon them.



CORN MINT.
(*Mentha arvensis.*) Perennial.
Branched stems 1-2 feet.

The worst part of these weeds is, that if a small part of the underground stems is left in the ground, it will form a parent stock from which, if unchecked, myriads of independent growths will arise.

Some of these weeds, by an interesting arrangement of their seed case, can when their seeds are ripe shoot them to a considerable distance. Several of the Crane's Bills and Balsams do this, so do some of the Pea family, Beans, and Bird's-foot Trefoil.

Others, like the seed of the Dandelion,

Groundsel, and Thistle, are easily carried a considerable distance by the wind, because of the ring of downy hair that is attached to them, which enables them to float in the air. Seeds of Grasses being particularly light are often carried about by the wind.

CRANE'S BILL.
(*Geranium Sanguineum.*) Perennial.
Stems 1-2 feet.

Cleavers and Burdocks have hooks attached to their seeds, and these hooks fasten on to the passer-by, and are often rubbed off in a suitable spot in which to take root and grow. They will cling to the fur, wool, and feathers of animals and birds, and may not be rubbed off till they are carried some distance from the spot where they were grown.

The sowing of impure seed is responsible for the growth of a quantity of weeds.

The sowing of impure Barley, Wheat, and Oats, often introduces wild Oats, Cleavers, and Charlock.

When weeds are thrown on to a manure heap, some of the seeds are killed by the heat of the manure, but others will retain their vitality, and only await a favourable chance to grow.

Some weeds, which possess a reserve of food in their thick tap roots, if thrown on to the manure heap will ripen their seeds. These seeds, which have ripened in the manure heap, will grow when the Manure is applied to the land.

The litter used in yards and stables often contains the seeds of weeds, and when it is applied to the land as manure, a portion of these seeds will grow.

CORN CAMOMILE.
(*Anthemis arvensis.*) Annual.
Stems from 1-2 feet. Heads 1-1½ inches.

How to destroy Weeds.

The great principle in getting rid of weeds is to cut them down before they seed. The younger they are cut the better.

The first time or two of cutting may not make

much difference, but repeated cuttings before seeding time eventually kills all plants.

The Cutting should commence in Spring and when the plants are young; they should be cut low down, close to the ground; if their heads are only just cut off not much good will be done. Some plants like the Colts Foot, in order to give their seeds a better chance of finding some suitable spot to grow, ripen the seeds before the leaves appear. Therefore the flower stalks of the Colts Foot plant must be cut down before they seed.

COLTS FOOT.
(*Tussilago Farfara.*) Perennial.
Leaves 3-10 inches broad. Head 1-1½ inches diameter.

You have not gone very far in clearing the land of weeds, if you cut down the plants after they have distributed their seeds.

The Plough, Harrow, Cultivator, Scythe, and Hoe are the implements used on the Farm to cut and drag out the useless growths. The

Spade, Hoe, Rake, and Spud are the garden tools used for the same purpose.

When you know that your land is well seeded with Annual weeds, encourage their growth above ground by making a good seed bed for them, and when the plants appear a few inches above the ground, root them up with the Plough, the Cultivator, the Hoe, or Harrow. This will get rid of a great number of weeds.

SCENTLESS MAYWEED.
(*Matricaria inodora.*) Biennial.
Heads about 2 inches in diameter.

Many seeds will lie dormant, buried in the soil for years, but when the ground is disturbed where they are lying, so that the air and sun's warmth can reach them, they will begin to grow at once.

This is the case with the Charlock, Black Mustard, Brome Grasses, and Poppies. Sometimes if you graze your pasture close with Sheep you will kill many weeds, such as the Yarrow and the Rag-wort.

The very best method of destroying weeds is to dry and burn them.

But if the cultivator prefers to collect them, with the other vegetable leavings of the Farm, into a compact heap, mixing the whole with a little lime; then the best plan, after they are well rotted, is to apply them to the Grass land, because the plants of the Grass land being in possession of the soil, gives them little chance to grow.

POPPY.
(*Papaver Rhœas.*) Annual.
Flower 3-4 inches in diameter.

On no account must the Compost Heap be applied to the Plough land.

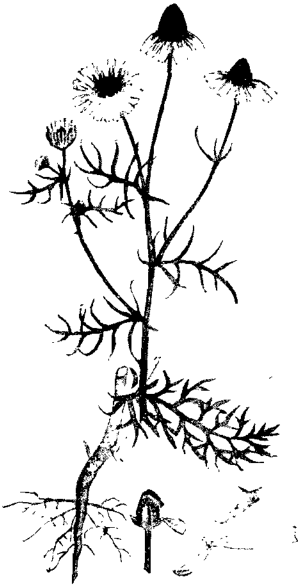
If the land grows Rushes, Sedges, and Horsetails, it shows that the soil is in a moist and acid condition. Drain it and sweeten it by manuring and cultivation, and these plants will slowly disappear.

Keep the headlands free from weeds, and spare no trouble to buy the best and purest seeds from firms of known repute. In buying

seeds, do not on any account be tempted by a cheap line.

If you give the land a good cleaning when the root crop comes round in its succession, and if you cultivate it skilfully and use strong clean seeds, and keep the headlands clean and be careful in manuring, you need then have no fear of a Weed-infested farm.

In that case the useful growths will take good care that the weeds do not gain the upper hand.



STINKING MAYWEED.
(*Anthemis Cotula.*) Annual.
Stems 8-18 inches.

Thistles.

It is not a pleasant sight to see the straw crops struggling and weakened in their yield, by a desperate fight with Thistles, and the pasture land showing signs of neglect by Thistles growing in large patches over its surface, which the cattle refuse to touch. The Thistle when examined individually is a very beautiful plant. When it

begins to flower examine it for yourselves. Notice its prickly defiant leaves and its purplish head of compact, compound flowers.

There are fourteen varieties of thistles in the United Kingdom, but only four of these varieties are really troublesome to the farmer—Spear, Cotton, Marsh, and the Creeping Thistle. The tallest and handsomest of the four, are the Spear Thistle, and the Cotton Thistle, commonly called the Scotch Thistle.

SPEAR THISTLE.
(*Cnicus lanceolatus.*) Biennial.
Stems 2-5 feet. Heads $\frac{3}{4}$-$1\frac{1}{2}$ inches diameter.

These two thistles are Biennials—that is, they flower during the second year of their life, and after ripening their seed die.

They can be got rid of by cutting down, or spudding, before they flower.

The Spear, the Marsh, and the Cotton Thistles undoubtedly propagate themselves by means of seeds, called Thistle Down, which are distributed by the wind.

Fortunately, Chaffinches and Goldfinches are very fond of the seed, and the Autumn rain also destroys a great quantity of it.

COTTON or SCOTCH THISTLE.
(*Onopordon Acanthium.*) Biennial.
Stems 2-5 feet. Heads $1\frac{1}{2}$-2 inches ameter.

SLENDER FLOWERED THISTLE.
(*Corduus Tenuiflorvs.*) Biennial.
Stems 1-4 feet. Heads $\frac{3}{4}$-1 inch diameter.

The Dwarf Thistle does a great deal of damage to Pastures in the South, but not so much in the North and Midlands. Its leaves lie flat on the ground and therefore occupy space which ought to be occupied by good growths, its flower stem is only about three inches high.

The Dwarf Thistle is a Biennial and can therefore be eradicated by the Spud or Hoe, if it is cut off before it flowers.

The most common pest to agriculturists of all the Thistle Tribe, is the "Creeping Thistle."

CREEPING THISTLE.
(*Cnicus arvensis.*) Perennial.
Stems 2-4 feet. Heads ½-1 inch diameter.

It differs from the other three Thistles named, because it is a Perennial and spreads its growth by creeping roots or stolens, which send up new plants at intervals, and by this method of growth it exhausts wide areas of soil.

Luckily for the Farmer, this Thistle does not seed itself so readily as the biennial thistles. But its roots dive into the soil to a great depth. Therefore it becomes a very difficult matter to eradicate it. This fact ought to prove how important it is that it should not be allowed to get hold of the land.

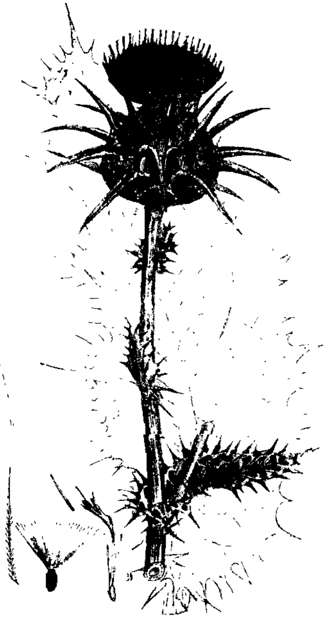
On arable land, deep and thorough cultivation

high farming and heavy smothering crops, and with care in Hoeing, Spudding, or Mowing the Thistles in the early Summer, they may be kept down.

On Grass land they are harder to get rid of.

By pulling and spudding they may be lessened in number. But on a Farm of any size this is an impracticable method.

The best way is to mow them directly *they appear above the* ground and to repeat this as often as they reappear; one mowing is not sufficient.



MILK THISTLE.
(*Carduus Marianus.*) Biennial.
Stems 1-4 feet.

If the leaves are cut off as often as they appear above ground, it will weaken the root underneath till it eventually dies, and if at the same time the grass is encouraged to grow, it will smother the young thistle plants as they appear above ground.

You seldom see the Thistle thrive in a field which is regularly mown for hay.

Some good authorities state, that if a pasture is badly infested with Thistles, the most effective and economical manner to get rid of them is to proceed as follows: Give the field 1½ cwts. of Nitrate of Soda per acre. Apply this artificial manure early in the Spring, and then lay it up for hay.

SOW THISTLE.
(*Sonchus arvensis.*) Annual.
Stems 2-4 feet.

The Nitrate of Soda will force the grass, and therefore the crop can be cut early. The Thistles being then soft and green will not damage the hay to any great extent.

When the Hay is harvested, feed the field closely with stock. Then remove the stock and apply a dressing of Farmyard Manure, or a dressing of suitable Artificial Manure in the Autumn. This will help to bring back the feeding value of the land.

If this is done a second year you will probably clear the land of Thistles.

Thistles will appear on the most skilfully farmed land, but they can be easily kept in

check by mowing them constantly. On no account must they be allowed to seed.

DARNEL.
(*Lolium Temulentum.*) Annual.
Spike 3-5 inches.

SLENDER FOXTAIL or BLACK BENT.
(*Alopecurus Agrestis.*) Perennial.
Stems 1-2 feet.

When once they have got hold of the land they are very difficult to get rid of, so that the old proverb "A stitch in time saves nine" applies very truly to Thistles.

If Thistles increase on a Farm it points to careless Farming, and the Landlord or Agent who cares for the welfare of his property, is never

too well pleased with the tenant who allows them to increase.

The following are some of the more common weeds which are found growing in most arable fields:

THE DOCK.
(*Rumex Obtusifolius.*) Perennial. Stems 2-3 feet.

Annuals, as you have read, grow from seed in the Spring, flower and ripen their seeds during the Summer and then die, leaving their seeds in the ground to grow into Plants the next Spring, when air and moisture are favourable.

Fumitory, Poppies, Charlock or Kilk, Sow Thistle, Spurrey, Shepherd's Purse, Knot-weed, Red Bartsia, Pheasant-eye, Crane's Bill, Corn Feverfew, Camomile, Chickweed, Mayweed, Corn Flower.

Biennials. A Biennial is a plant that forms leaves only the first year, and after having flowered and seeded, dies the second year;

Cotton Thistle, Spear Plume Thistle and Scentless Mayweed.

Perennials. A Perennial is a Plant that takes possession of the ground by a network of roots, sending out here and there shoots which grow into Parent Plants, and these then continue the process;

CORN COCKLE.
(*Githago Segetum.*) Annual.
Stems 1-2 feet. Flowers 1½-2 inches diameter.

Docks, Colt's Foot, Bindweed, Ox Eye Daisy, Creeping Nettles, Thistle, Onion-grass, Dwarf Spurge, Corn Mint, Speedwell, Couch Grass, Slender Foxtail or Black Bent.

COTTAGE GARDENS.

THE second part of *Country Reader III.* will endeavour to convey to the reader, some hints which may be found useful in helping him to make the best use of the cottage garden, and the live stock which can be kept by the small holder, or cottager.

No teacher or book can take the place of your own work and experience.

To work with your own hands in your own garden, to feed, tend, and observe your own stock, will teach you more than any number of books can ever do.

Books are useful in helping observation and in giving information concerning the methods, other than your own, employed by successful people in different parts of the country, with whom you cannot manage to speak and compare notes, and the conditions of whose surroundings may be different to your own.

It is interesting also to work at and observe your own things, and then to compare what you

have learnt in this first-hand manner with the information given in books. If the two agree, how strongly the knowledge thus acquired becomes impressed on your mind, and how much confidence it gives you.

COTTAGE HOMES.

If they disagree, well, you may be right and the books wrong, or the books may be right and your observations may have been made in too great a hurry, and therefore on this account may be inaccurate; or you may have had to work under conditions which the writers of the books had no knowledge of.

The only plan is for you to go on working and

observing, making your own simple experiments, remembering and taking notes of what they may teach you.

If you always keep two or more fattening pigs in your sty, and a few head of carefully selected poultry, and preserve and make the best use of the manure that they make, and use to the best advantage the ashes, slops, soot, drainage, hedge trimmings and garden refuse. And if you dig and cultivate and look after your garden in a skilful manner, and grow a wise succession of crops, kept free from weeds, it will surprise you what your garden will produce, and this without putting your hand into your pocket to buy manure.

There is no better manure, when it has been treated properly, than the scrapings of the road and the cleanings out of the ditches; therefore, if possible, get a few barrow loads for your own use, instead of letting the local dust-cart carry it away.

Sometimes round about the cottages there is plenty of rich herbage, growing along the road sides and lonely lanes, which is never made use of. If you take a scythe or hook and gather some of it into an empty sack, you will find it a great help towards keeping your pigs and poultry in health, especially during the spring and summer months.

Do not waste anything or think anything too insignificant to make the best use of.

A GOOD CROP OF BEANS.
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Be generous if you like, but never waste.

The worst waste of all is to neglect your bit of land so that it does not yield its best. Not only does the loss fall on your own shoulders, but the

loss also falls on your neighbours, your district, and the nation. The more you grow the more food you, your neighbour, and the nation will have to eat. The more we grow in our own country, the happier, stronger, richer and more prosperous does the nation become.

Every pound that we spend for things we import,—that we ought to produce, is a pound given to the foreigner, which ought to have been spent amongst ourselves.

It has been said, and very truly said, that the soil is the mother and source of all wealth—that thin spreading bit of surface soil that gives us our crops. The coal seams and iron ore may fail, copper and tin mines may be worked out, but the surface soil, if generously and wisely treated, never fails us.

Season after season, year after year, generation after generation, the seed we scatter we gather with its bounteous increase.

It is the man or woman who cultivates the land that is dealing at first hand. Theirs are the hands that wrestle with the soil and cause it to yield its increase.

And what hard work, patience, knowledge, and experience does that mean.

The manufacturer and the retailer are dependent for their trade, and we for our food and clothing, on those who work the soil.

If this is so, and how can anyone deny it, how noble is the work done on the land. It is surely the noblest and greatest of all work, and work that if well and successfully done, requires a long apprenticeship, great patience, very close observation, and a retentive memory.

It requires also, always some fresh trial and experiment to be made, for in this as in everything else there can be no finality, and a mind quick and bright to see and make use of any improvement that the trials made may suggest.

The Position or Site of the Garden.

You may not be able to select a site as most of the gardens are made already, and good sites are few. Therefore, you will probably have to be satisfied with the best that you can obtain.

You will be very fortunate indeed, if you can obtain a garden with three feet or so of deep rich loam, sloping from your cottage towards the south, with a point or two of east in it. This position will enable the garden to get all the sun there is throughout the day, and in this country, where the weather is so often cloudy, what sunshine there is is very valuable and a most important consideration.

The worst aspect for a garden is north and north-east.

Sometimes the winds from the south and south-west, especially during the Autumn months when the apples and pears are ripening, are very high, and therefore a hill or wood in that quarter, to break the force of these winds, will be a help to the garden.

The elevation of the garden should be at a moderate height, neither at the top nor at the bottom of a hill. The bottom of a hill is generally damp and therefore catches the early and late frosts, a condition of things against an early and late garden, and an early and late garden means a profitable garden. The top of a hill is generally too exposed to the cold north and east winds during the Spring, and these cold winds tend to cut back and injure the plants and trees and retard their growth.

If a site has to be chosen either on the top of a hill or in a valley, the top of the hill would be the better one if that of the valley has a damp aspect.

The best aspect for a garden, provided there is a good depth of soil, is about half-way up a hill sloping south, with a cottage at the higher end protecting it from the north.

A garden on a slope is naturally drained of any surplus water. It requires no artificial drainage, which is a great consideration.

Artificial drainage is never so good as natural

drainage. Good drainage is an absolute necessity for the health of everything, and the best drainage is a natural drainage—the drainage that carries the surplus water away by a slope, or that drains it through a porous subsoil.

A GOOD SITE FOR A GARDEN.

By natural or artificial drainage stagnant water must be got rid of, if the animals and crops are to do well. It is not the least use trying to garden on land that is not well drained.

Fencing the Garden.

The question of what sort of fence to put round a garden is a disputed one. The writer is

inclined to think that a wooden paling from six to eight feet in height is perhaps the best. Such a fence does not exhaust the soil near it, and protects the garden from the cold north-east winds of Spring and the violent south and west winds of Autumn. Also, and this is a great consideration, fruit trees can be trained against it. On the other hand this kind of fence is not pretty to look at, and will cast its shadow at different periods during the day over certain portions of the garden.

If you decide upon a hedge; then the best hedge known at present is one made up of hard woods. Quick, or white thorn, and Holly are termed hard hedges.

Holly takes a longer time to grow than Quick, but if it is properly trimmed and not allowed to get thin at the bottom, it makes an admirable and picturesque hedge, a good protection against strong and cold winds, and a certain barrier against straying and unruly cattle.

The Holly hedge is said not to rob the ground of so much plant food as other hedges. A successful cottage gardener says that his experience has shown him that the Privet hedge is the worst in this respect.

He says that he has noticed that if he puts manure within a certain distance of a Privet hedge, its roots turn towards the manure, and

travel for long distances in search of their food in the manure. On no account should a boundary fence be made up of soft growths, such as Privet, Laurel, Beech, Oak, Hazel, and Ash. These growths exhaust the soil near them and

"FLOWER OF SPRING" CABBAGE.
Copyright, Sutton & Sons.

are of little or no protection to the garden from the cold winds, and are useless against straying cattle. Moreover, and this has to be considered, they are inclined to grow thin at the bottom, no matter how you trim and lay the top.

The trimming of a hedge is quite an art and requires considerable experience. Unfortunately there are very few country people left who

really understand how to trim and lay a hedge so that it grows with a thick bottom, with the whole hedge well knit together and of a compact appearance.

Drainage of Gardens.

It is useless to try to garden on a badly drained soil, because stagnant water excludes air and warmth and produces dampness, coldness, and sourness, and no cultivated plant can do any good under such conditions.

To drain by means of drain pipes is often a very costly affair. A simple and inexpensive method of draining a garden, is to cut open drains through it, from two to three feet deep, and direct them into some outlet or ditch.

You can run these surface drains into each other as you think best, and eventually drain them into a ditch. But be very careful that the outlet into the ditch is kept clear, and that the water in the ditch is able to run away without impediment.

Land is said to be water logged, when the rain collects in pools and does not run away. Sometimes when the soil has been dug without any variation, to the same depth, beneath this depth a hard pan or layer of earth is formed, and this collects the water and prevents it draining away.

If this should be the case the hard pans must be broken up, either by digging to a greater

depth than you have been accustomed to dig; or the surface soil must be removed, and the hard pan broken up with the spade or pickaxe.

Either of these two processes will probably cause any water, that has been collected by the

"AUTUMN MAMMOTH" CAULIFLOWER.
Copyright, Sutton & Sons.

pan, to percolate into the subsoil and drain away.

If the garden is very damp and there is no natural or artificial drainage, and the water collects and shows no inclination to drain away, some Cottagers find it a good plan to throw the soil into ridges and grow their crops on the ridges.

In this way every furrow between the ridges becomes a surface drain, and the cultivated soil

thrown into the ridges becomes one-third deeper, in which the plants can search for their food.

Why we dig and Cultivate.

We Dig, Break up, Rake and Hoe the soil, in order to expose as great a quantity of good soil as possible to the purifying processes of the air, to the warming effects of the sun's rays, to allow the rain water to run through and moisten it, and to enable any standing water to drain away.

We also dig and cultivate to get rid of the growth of weeds, to clear the land from the seeds of weeds, and to get rid of the insects that are sleeping their winter sleep as Chrysalises.

The Spade, the Rake, and the Hoe, do for the garden what the Plough and Harrow does for the Field. But the Spade and the Rake turn up the soil to a greater depth and subdivide it more thoroughly than the Plough and Harrow. Also the Spade, Hoe, and Rake get rid of weeds and their seeds much more effectively than the Plough and Harrow.

If the Manuring is equally well done in both cases (it is generally much better done in the case of a Garden), on account of the superior Cultivation of the Garden, it will produce far more abundant and finer crops to the acre.

In other words, we dig and cultivate in order

that the soil may be warm, suitably subdivided, well drained, and also that it may retain a sufficient amount of moisture, and yet not too much.

We dig and rake to subdivide the soil, so that the roots and the plants may have a greater number of earth particles to creep round in search of their food.

If you refer to the Chapter on the Seed Bed, and read again very carefully what is there written about the necessity for soil subdivision, you will at once understand how important it is that the soil should be subdivided by the Spade and Rake, into as many small earth particles as possible.

Digging of a Garden.

The Digging of a Garden generally turns up the surface soil from 10 to 12 inches. The Plough generally turns the soil up from 6 to 8 inches. Not only does the Spade turn up the soil to a greater depth than the Plough, but in the hands of a skilled workman it does it much more effectively.

If you wish to dig to the best advantage, dig straight down, so that you may turn up the greatest depth of good soil that your spade will allow.

It is of course easier to dig in a slanting direction, and you may be able to get over the ground more quickly, but you will probably

turn up the soil about 9 inches in depth, instead of 12 inches, and the loss of those 3 inches may mean a smaller and less handsome yield of fruit and vegetables.

So when you dig, dig slowly and carefully, with your spade very upright, and dig evenly so that when your work is finished the digging is deep, the lumps of earth well broken, and the whole surface presenting a neat and even appearance.

Level work not only looks better, but it enables the Planting and Sowing to be done with greater regularity and ease, than can be done if the surface is rough and uneven.

It is a mistake to think that anyone can dig. True anyone can dig in a fashion, but inexperienced, slovenly digging is not of much use.

A good digger must have had experience, his muscles must be well developed and he must be in sound condition, and by knowing how to conserve his strength he must be able to dig for a considerable time at a stretch, without feeling dead beat.

In digging he must use his head as well as his arms.

No good work can be done on the land without the use of the head. Head and muscle must work together. There is no work that requires

the use of the head more, than work connected with the land.

If the clear head does not think out, and the controlled habit carry out a system of work based upon experience and observation, then the work done will result in failure.

Trenching of a Garden.

The Principle of trenching is a very simple one. It is done to increase the depth of the good soil as much as possible. The word good soil, of course, means all that beautiful, rich, finely-divided surface soil that contains the remains of vegetable substances that have gradually found their way there, and the remains of manures that from time to time have been placed there. It is this soil we mean when we use the word humus or organic soil.

Clay, sand, gravel, and chalk contain little or none of these organic remains, and therefore being deficient in Humus they are practically useless for the growing plant. We term these soils inorganic soils. But when this inorganic soil is mixed in rightful proportions with the organic or Humus soil, we obtain a soil which, if cultivated wisely, will result in a heavy cropping and profitable Garden.

The whole art of digging and cultivation, is to bring into use as great a quantity of good soil as

possible. In some places this good soil may be several feet in depth, and when this is the case there is no need to Trench.

In other places, perhaps the more numerous, this good soil only extends to a depth of a few inches, and when this depth is reached the Spade comes to clay, sand, gravel, chalk, or a mixture of these.

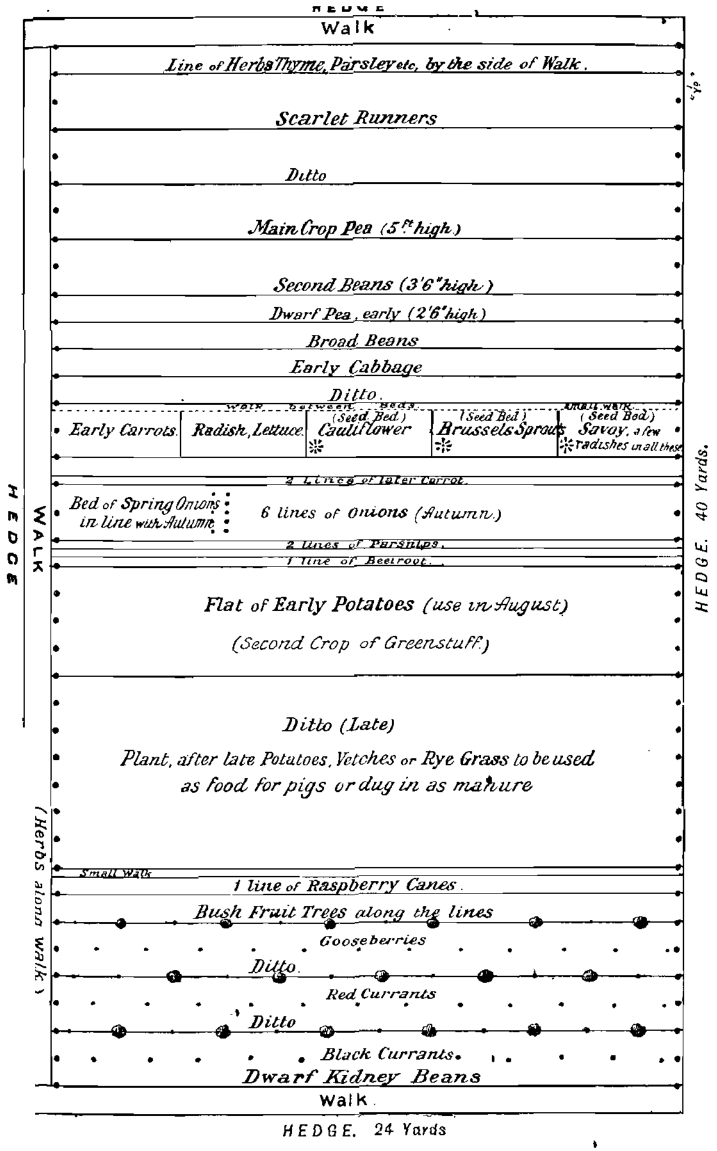
The great object then of trenching is to break up the subsoil, as it is termed, and mix it with manure so that it may gradually pass into the good surface soil for the Plants to thrive in.

The process is generally as follows: The portion decided on to be trenched, is marked out into certain sized squares.

The surface soil of the first square is then dug out and wheeled to the end of the squares marked out.

The subsoil of the first square, which has had the surface soil removed, is then broken up to a certain depth by the spade or pickaxe, and manure mixed with it, and then the surface soil of the second square is dug out and thrown upon the subsoil of the first square. The subsoil of the second square then receives the same treatment as the subsoil of the first square.

The surface soil of the third square is then thrown on to the subsoil of the second square. All the squares are treated in the same manner,



PLAN OF A GARDEN, BY A SUCCESSFUL COTTAGE GARDENER.

the subsoil of the last square being filled in with the surface soil of the first square, which is lying close at hand ready for the purpose.

One of the writer's Cottagers, who has a garden which is the talk of the neighbourhood, says, that if you are to have a profitable garden, where there is not a very great depth of surface soil, trenching is a necessity. This man, when he began gardening operations several years ago, had as poor a bit of ground as you could find anywhere. By careful digging, cultivating, and manuring, but principally owing to double trenching a small portion of his garden each year, he has converted a piece of waste, poor soil, into a garden that for its size is not to be beaten in the district.

Have you seen so-and-so's garden, is the common talk of the neighbourhood, and if you were to see it it would astonish you. This man has all his life worked on the Estate, and his garden is the result of the labour and thought expended by him after his regular hours of work are over.

Manuring the Garden.

As you have read in the chapter on manuring, the four foods which the plants take from the ground, which you must return if your garden is not to be starved, are Nitrates, Phosphates, Potash, and Lime. If you keep 3 or 4

pigs in your sty and give them a bedding of wheat straw, and make good manure with it, adding to it the leavings of the house and garden, the manure made will supply Nitrates, Phosphates, and Potash to the plants.

BRUSSELS SPROUTS, "EXHIBITION."
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[1] One writer well says "that the three most important plant foods, Phosphates, Potash, and Nitrates, may be likened to a golden Tripod.

"If any one of these three substances be wanting, no excess of the other two will make good the deficiency.

"Remove a leg from a Tripod and over it falls; plant it firmly on its three legs, and a slender Tripod is capable of supporting a great weight."

[1] Mr. H. H. Cousins, *The Chemistry of the Garden.* 1/-. Macmillan & Co., Ltd.

If we give our plants a free supply of Potash, Phosphates, and Nitrates, under healthy conditions, they will grow and flourish exceedingly and as luxuriously as the season, climate, and position will allow.

Nitrates promote growth. They darken the green of leaves and make them larger and more vigorous.

Phosphates promote fruitfulness and early ripening, and are far more necessary to the Garden and Orchard than to the Farm.

Potash improves the quality and flavour of fruit and the scent of flowers.

The pungent smell that you must often have observed coming from a freshly made manure heap is caused by a gas called Ammonia.

If there were no Germs present in the heap this escape could not take place. The oxygen of the air combines with the ammonia gas as it escapes from the manure heap and forms Carbonate of Ammonia or Smelling Salts.

The decay of the manure heap is brought about by the action of air, moisture and living organisms. As the decaying process goes on ammonia gas is formed. This gas, if it is not allowed to escape into the air, is taken hold of by the germs and converted into nitrates or soluble plant-food; in this state it becomes liable to be washed away by rain or water.

It has been well said, that the best part of the manure heap is always trying either to "fly away" or to "run away."

When this manure is applied to the soil, if there is enough Lime present, the Ammonia becomes fixed in the soil. If there are present also the right sort of Germs (and this stage is so interesting), these eventually convert the Ammonia gas into a Nitrate. You will at once see by this short description, that it is the Germs in the soil that break up the properties in the Manure and build up from them food for the plants. Hence the supreme importance of having a sufficient number of these useful Germs present in the soil, to enable the crops to grow and produce their best.

The raw material may be there in abundance, but the raw material without the manufacturer is of little use for the purposes of practical life.

The most effectual method of securing a sufficient number of these little Germs in the soil, is to manure the garden with the manure from the pig-stys and Farmyards. The manure from the sty should contain some wheat straw, and the whole should be well rotted and dug into the soil.

The soil also must be well dug and cultivated, so as to allow air, sunlight, and moisture to

penetrate to the little soil Germs, in order to keep them in a vigorous and healthy state. Weak and unhealthy soil Germs, like weak and unhealthy people, cannot do the best work.

If you have a sufficient quantity of manure, put it on all over the garden when it is ready. But if there is *not* sufficient for a good dressing for the whole, which is often the case, it is better to manure one half of the garden well, and to manure the remaining half the following year.

To the part that is not having any manure from the Pigs or Poultry carry the liquid manure, from the pig tank, mixing with it all soapy slops, and when the unmanured plot is dry give it a good soaking with this mixture.

If there are any road scrapings about the roads and lanes near you, collect and mix them with the nightsoil, and place it at the bottom of the soil that is being trenched, mixing it carefully with the subsoil that has been broken up by the spade or pickaxe.

If you keep poultry, collect the manure and place it in any old barrel, preventing the wet from getting to it. Poultry manure is strong, and ought to be mixed with some soil before it is applied to the land. The Manure made by pigeons is also a very rich fertiliser.

When the chimneys are swept, keep the soot and spread it over the onion bed, applying it just

before rain is likely to fall, so that it may be well washed into the soil; it helps the crop on a great deal.

Collect all the leaves, hedge trimmings, and the

A GOOD CROP OF ONIONS.
Copyright, Sutton & Sons.

refuse of the garden that the pigs will not eat, and the clearings out of the ditches; place these waste products in a heap together, mixing some lime with them, and pour over the heap from time to time the slops from the house.

Such a heap, when properly mixed and rotted, will make a first-rate manure for the Garden.

Liming the Garden.

It is stated by some of the best authorities, that rich garden soil is nearly always deficient in lime, and that it is nearly always benefited by the application of lime.

If a garden has been properly drained, skilfully dug, cultivated, trenched, and wisely manured, and notwithstanding the crops do not look as healthy as they should do, or the yield is not as abundant as you might expect, you may safely think that the soil is deficient in Lime.

No matter how highly you manure and cultivate a garden, it cannot be brought to its highest state of fertility unless it contains one part of lime to 200 parts of soil.

Thousands of tons of manure are wasted, because Lime is not present in sufficient quantity in the soil.

High manuring always means a great demand on the Lime in the soil.

Lime or chalk is necessary for the fertility of the soil. It counteracts sourness, and is necessary in order that the elements of the soil may combine in the finished form of food, which the plants can take in.

If you can get Chalk in your district, break it

up into small lumps and well mix it with the surface soil, applying it at the rate of 1 to 3 pounds per square yard of soil.

If Lime can be obtained locally it should be applied in the form of Slaked Lime, ground to a fine powder. Three to eight ounces per square yard is a safe and economical dressing. If you cannot get Chalk or Lime in your district, then it is better to use either Basic Slag, or Bone Dust, because these artificial manures not only contain Phosphates, but they also contain a certain quantity of Lime.

Lime not only sweetens the soil and helps the living Germs to do their work, and is necessary to Plant food, but by getting to the roots of Plants it checks a disease to which the Cabbage and Turnips are liable, called Clubbing, and still more it checks the ravages of many injurious insects.

Lime is best applied during the Winter months.

Chalk, or Limestone, as you know, is found in solid masses of rock. Many of you may have noticed the chalk through which some of our railway cuttings are made.

In order to produce the Lime that you use to lime the gardens, Chalk or the Limestone is burnt in a kiln.

Out of every 100 pounds of Chalk thus burnt, 56 pounds of Quick Lime is obtained,

and 44 pounds of Carbonic Acid gas is given off.

It is the Quick Lime that is used when we say that land is being limed.

Sometimes, however, water is added to the Quick Lime, the result being what is called Slaked Lime. Slaked Lime is what some people use to lime their ground with.

The Garden Manure Heap.

If the manure heap is not made on the wisest principles it loses half its value. One ton of well-made manure goes farther than 2 tons of badly-made manure. Even if you keep Pigs and Poultry, feeding them in a profitable manner, making the best use of the manure obtained from them and the waste products of the house and garden, you will find that you will still have barely sufficient manure to supply all the requirements of the plants in the garden. Therefore the importance of making the manure heap well, so that it may go as far as possible.

The great principle in making a profitable manure heap, is to build it in such a form that you fix in it a large proportion of the Potash, Phosphate, and Nitrate that it contains.

If these substances, as valuable to the Gardener and Farmer as gold and precious

stones, escape into the ground on which the heap stands, or run from the heap down the drains, or escape as gases into the air, then by just so much will the manure heap lose in value.

Therefore the first point of importance, is to see that the bottom on which the manure heap stands, will not absorb the moisture that drains from the heap.

A well-beaten bottom of clay, or any hard or impervious bottom, will effect this.

The heap must be made after the manner of a stack; the top of the heap must bulge slightly beyond the bottom of the heap, and the whole must be built in such a fashion, that most of the rain that falls, instead of soaking into the heap, will shoot off it.

Surround the heap with a wall of earth a few inches high, and when this is saturated by the liquid that drains from the heap, throw it on to the top of the heap and surround it again with a fresh layer of earth, and continue doing this as often as necessary.

It is just as well that the earth you surround your heap with should be clean, well-cultivated soil, not likely to contain too great a number of the seeds of weeds.

It is an excellent plan and one not generally known, to cover the hard bottom on which you propose to build the heap with a few grass sods,

or with a few inches of good clean garden soil. You will find that by the time you apply the manure to the garden, this bottom soil will have become richly impregnated with plant food, and that when applied it will have the effect of producing excellent crops, even better than that part of the garden to which the manure has been applied.

The best plan of course is, just before using the manure, to fork it over and thoroughly mix it all together; and to saturate it well with any liquid manure that may be in the liquid manure tank, the day before applying it to the garden.

There is no more effectual manner of applying liquid manure to the soil, than by collecting it in a tank, or a hole in the ground which will retain moisture, and then from time to time emptying it over the manure heap, especially just before applying it to the land.

Please remember this point. No manure heap must be allowed to get dry. If there is any appearance of it doing so, give it a wetting from the liquid manure tank, or throw some slops over it, or some water—rain water for preference.

There is another effectual and simple method of using up the liquid manure. Make the hard and impervious bottom on which you propose to stack the manure just outside the pig-sty, then

dig round it a shallow channel, which will drain the liquid manure into the tank; drain the liquid manure from the pig-sty by another channel into the same tank, and then when the tank is full, or the heap shows signs of getting dry, empty the contents of the tank over it. Cover the tank with a few boards to prevent the rain falling into it.

The tank, three feet deep or so, is easily made.

It is of course best to build the bottom and sides of the tank with hard impervious brick; but if this cannot be managed, build the bottom with brick and beat the sides as solid as you can with a spade. If you cannot get bricks to floor the bottom of the tank and it is composed of clay, tread it down and beat it firm and solid. If the bottom should not be of clay, then try to get a few spadefuls of clay and lay it at the bottom of the tank, and by beating and stamping make it solid and impervious to moisture.

There is nothing more distressing than to see the waste of good manure that is going on all round — waste in the village, waste in the country, waste in the big towns.

If all this waste could be saved and applied to the soil, what a prodigious return it would yield for the treatment, over and above what it does now.

Large farms, small farms, farm cottage holdings, and cottage gardens, would indeed yield an amount much in excess of what they do to-day. It is impossible to say how much.

Manure heaps, so called, spread over a wide area instead of being stacked into a compact heap. Manure heaps allowed to get dry, causing the plant food to escape as gases into the air, instead of becoming fixed in the heap. The liquid available plant foods from cow house, pigsty, stable and manure heap, as valuable almost as their weight in gold, escaping down the drains.

It may be said without undue exaggeration, that the prosperity or adversity of British Agriculture, depends on the manure heaps of the country.

The better the natural manure heap is made, the less need will there be for the agriculturalist, or gardener, to put his hand in his pocket for the purchase of artificial manures.

In the writer's opinion the manure heap is the foundation stone, on which rests the structure of agriculture and horticulture.

The manure heap if well made, will force the land to grow two blades of grass where one grew before, and will force the land to yield heavier crops of wheat, oats, barley, roots, vegetables, and fruit.

And, remember, this heavier yield means sheer *profit*. The rent, the labour bill, and the cost of cultivation, remain practically the same whether 30 Bushels of wheat is grown to the Acre, or 35 Bushels. But 30 Bushels may mean a loss, whereas 35 Bushels may mean a profit. Just in proportion as the Manure heap increases in quality and value, will the stack yards be filled with grain and straw; the feeding stalls filled with profitable fed beasts; and the tying houses occupied by healthy milking cows.

The Manure heaps govern it all.

GARDEN CROPS.

VEGETABLES, if well cooked, are the most wholesome of foods that we can eat.

A small garden of well-stocked vegetables—what a great deal it signifies. So much thought, so much observation and knowledge, guided by the brightest intelligence, and a patience that is not disheartened by inclement weather.

Even a poor soil can in time, by trenching, digging, manuring, and cultivation, be made into a profitable garden.

There are certain vegetables grown for the sake of their underground parts, such as the Beetroot, Carrot, Parsnip, Onion, Leek, Turnip, Jerusalem Artichoke, and the Potato.

These underground parts are dug up and stored, and during the winter months, when there is little else in the garden to eat, they give us an excellent and varied vegetable food. All of them are especially wholesome and nourishing.

Beetroot is rich in sugar; Carrots are rich in

phosphates. Beetroots should be eaten only when they are full grown, but Carrots can be eaten at all stages of their development or growth.

"NEW RED INTERMEDIATE" CARROT.
(Copyright, Sutton & Sons.)

Parsnips when fully grown and properly cooked are most wholesome.

Onions, as we all know, are very wholesome. Some working men, who work in the open air, will tell you that a meal made of bread (home-

baked if possible), and fresh, rich Cheese, with a slice or two of raw Onion, is one of the most staying and strengthening meals that they can work on.

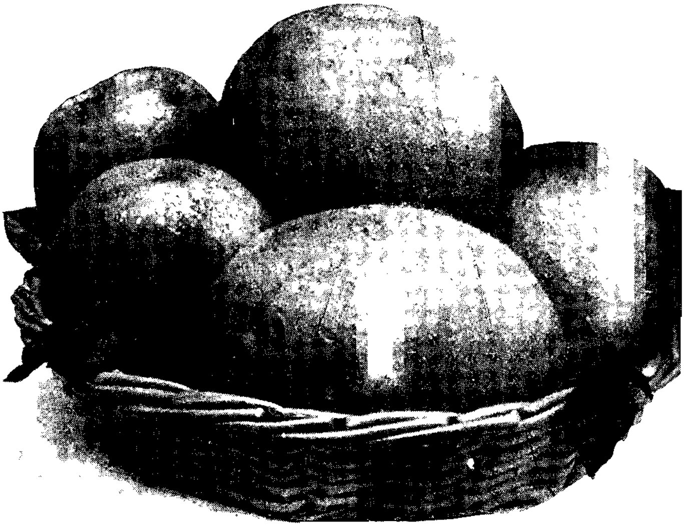
In cooking Parsnips don't scrape or peel them, but wash them and cook them whole in the pot,

TRUE PARSNIPS.
(Copyright, Sutton & Sons.)

just covered with water; boil them slowly for about an hour and a half, according to the size of the root, by which time the water will have almost disappeared, and they will taste nice, and are much more nutritious than when served in close, watery slices.

There is no need to say much about the Potato. It is to the cottager the chief of garden vegetables. There is no crop that requires such

good manuring, if the plants are to grow a good crop. But very strong manure, such as pig manure, favours disease. It is better to manure heavily for a cabbage crop, and the next year plant with potatoes without any additional manure.

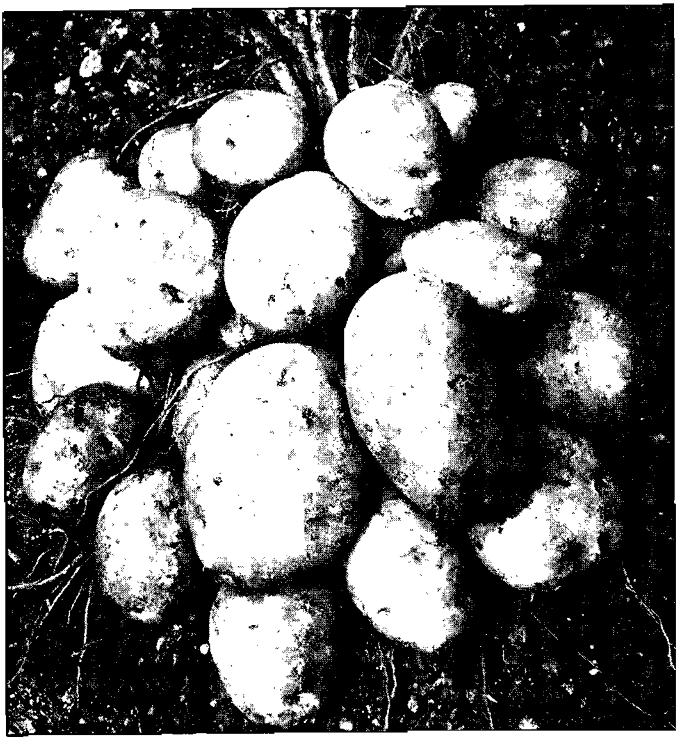


"WINDSOR CASTLE" POTATO.
(Copyright, Sutton & Sons.)

Many people who cannot eat a potato peeled and boiled in the ordinary way, can eat them with impunity when cooked in their jackets, or skins.

There are certain vegetables which we call pod-bearing vegetables. Some of these, such as Peas

and Broad Beans, are grown for the sake of



PHOTOGRAPH OF A SINGLE ROOT OF THE "DISCOVERY" POTATO.

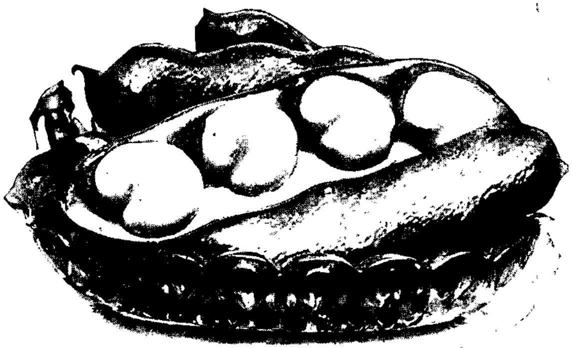
Under ordinary field cultivation. 160 lbs. has been grown from 1 lb. of seed, all free from disease. The haulm is tall, upright, stout, and hard in fibre, indicating an extremely robust constitution. The tubers are pebble-shaped, with white, slightly russeted skin and shallow eyes. The flesh also is white, firm, and when cooked has an admirable floury texture, and the flavour is excellent. This potato is for late crop.

(Copyright, Sutton & Sons)

their seeds, while others, such as the Tomato, Cucumber, and Vegetable Marrow, are grown

for the sake of the pulpy matter, which when fully developed contains their seeds.

The vegetables that are grown for the sake of the underground parts we eat chiefly during the Winter, while those that we grow for the sake of their pod or fruit are of summer growth, and are eaten during the Summer Months.



"GIANT WINDSOR" BROAD BEAN.
(Copyright, Sutton & Sons.)

Of the Pea, and Broad Bean, we eat the seeds only; of the Runner, and French Bean, we eat the pod and the soft seed.

In preparing Vegetable Marrows for cooking we reject the seeds; of the Cucumber we eat the fruit before the seeds are developed.

It is in the pulp of the Marrow, Cucumber, and Tomato, that we find our food, and in each case it differs in flavour and method of use.

Green vegetables and salads—what a wide, varied, and hardy number of vegetables come under this heading.

It is chiefly composed of varieties of the cabbage family. Some we have cultivated till we have reached the condensed marrow-like head of

"PRIZEWINNER" RUNNER BEANS.
(Copyright, Sutton & Sons.)

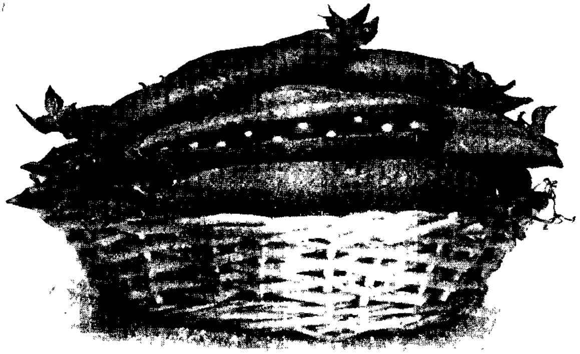
the Cauliflower and Brocoli. Some we have developed into hearts, as the Red, White, and Savoy Cabbage. Some we grow for sprouts, such as the Brussel Sprout, and others we grow for their leafy heads, as represented by the various Kales.

The Cauliflower is a tender plant, and only grows its head in the Summer and Autumn,

while the Brocoli grows its head—the imperfect flowers of the plant—during the Winter and Spring.

Winter Spinach is a very useful vegetable.

Then there are the Lettuces and Endive for eating green and uncooked.



"SELECTED DUKE OF ALBANY" PEAS.
(Copyright, Sutton & Sons.)

There are two chief varieties of Lettuce, the upright or Cos Lettuce, and the spreading or Cabbage Lettuce.

Cos Lettuce is grown principally for Summer use, and though much crisper is perhaps less easily digested than the Cabbage Lettuce.

The Cabbage Lettuce can be grown all through the Summer, but is more suitable for the late Autumn, Winter, and Spring than the Cos Lettuce.

There are certain useful herbs, which we grow in our gardens, which ought to be planted as close to the kitchen as possible, so that when required for cooking purposes they can be gathered and used quite fresh.

It is as well to have a small plot specially devoted to these herbs, Parsley, Mint, Sage, Sweet Marjoram, Sweet Basil, Fennel, and Lemon Thyme.

There are certain vegetables cultivated for the sake of their stems—Seakale, Asparagus, Celery, and Rhubarb; there is also the Mushroom.

Fruits.

Gooseberries, Raspberries, Black Currants, and good cooking Apples which will keep through the winter, are probably the most profitable fruits for the cottager to grow.

Gooseberry bushes can be grown under Apple trees if the Green Gooseberry alone is required. The Gooseberry bush is one of the first of the garden fruit trees to come into leaf and flower, and to form its fruit, and the young Green Gooseberries can be picked before the bushes are shaded by the Apple trees.

For market purposes the Early Green Gooseberry, picked when small, is a more profitable crop than it is when picked ripe.

But of all the bush fruits there is none so

valuable and so easy to sell as a good crop of Black Currants. The Black Currant is very wholesome and very much liked for stewing, cooking, puddings, and preserving in the form of jam. It is an excellent fruit for children, either when raw, cooked, or preserved.

If the writer were asked what fruits the cottager should grow for the use of his family, he would recommend Gooseberries, Black Currants, good keeping, eating, and cooking Apples, Victoria Plums, and Damsons.

The walls of a house, provided they face south and west, and many a stretch of paling that surrounds the garden, might be used for training and growing early Plums or Pears.

If a good Nectarine or Apricot will grow and ripen in these situations so much the better, but let no square inch of soil be unoccupied, and no foot of wall or paling be without a suitable growth climbing over its surface.

It would be impossible to touch upon, ever so lightly within the space of this book, how best to grow the different vegetables and fruits which have been mentioned.

This you can only learn from your own training, experience, and observation, supplemented by reference to a simple, practical text-book on the subject.

COTTAGE PIGS.

The most useful animal to the cottager is the Pig.

Two or three wisely selected, healthy pigs in the sty, mean to the cottager a well manured and profitable garden, a supply of nourishing food for his family, and if he understands them, a few pounds in his pocket at the end of the year.

Those who know nothing of the conditions and requirements of country cottage life, have often said to the writer, "How can you be so interested in pigs, they are so ugly and dirty." Well, in his opinion they are neither ugly or dirty.

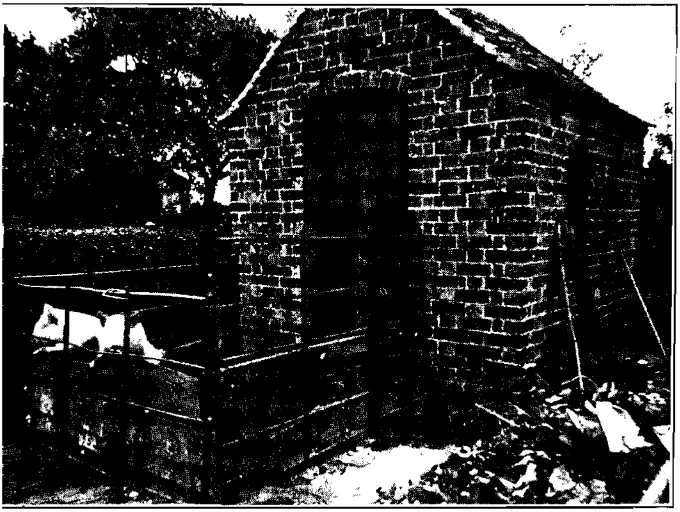
A well-bred pig, active on the leg, clean, healthy and bright-looking, is in his opinion a very good-looking animal.

The short head, prick ears, straight back, deep sides, short, strong and straight legs, sound feet, curly tail and silky coat, surely give no unsymmetrical appearance.

Then as to a pig being a dirty animal, how

much truth is there in that? Of all farm animals a pig, if you only give him a chance of being clean, is the cleanest.

If we were placed in unclean surroundings, and had no means of obtaining the wherewithal



A LOOSE-BOX STY, WITH THE RUN MADE OF IRON HURDLES.

to keep ourselves clean, should we be clean? It is just the same with the pig.

Some pigs are naturally clean, while others have to be taught to be clean.

One of the writer's cottagers, a most successful man with pigs, whenever he bought a fresh lot of pigs, for the first few mornings after placing them in his stys, trained them in the

ways of cleanliness. They soon learnt their lesson, and when once it was learnt they never afterwards offended.

Like a wise, sensible, and successful man, he swept their runs out and shook up their straw bedding each day; kept their feeding troughs clean, and white-washed each sty three or four times a year.

This man is really fond of his pigs; he watches and tends them with great care, and of course he has been successful with them and has made them pay, as you or any one else can do, if you have as much knowledge of them and take as much interest in them, as he has always done.

His pigs never suffer with joint evil, or become lame, and are never sick; they always look clean, healthy, and happy, and at the auction invariably fetch the top price.

There is, however, another and a principal reason why pigs, and especially the pigs belonging to the cottager, are worth our interest and consideration.

In many a cottage home, when the parents have been struggling to provide for a young family, the pig has just made the difference between want and enough to eat, and turned the scale in the right direction.

If you wish to tell how the cottagers are doing, visit their pig-stys, and if you see two or

three pigs in the sty looking healthy and sleek, and the sty clean, sweet, and well kept, you may come away and feel happy about that family.

Do Pigs Pay?

The cottager whom you have been reading about has kept pigs for many years. He says, taking one year with another, if he buys three small store pigs at about £1 each, and buys the right sort; and provided the market price and the price of feeding stuffs is about the average, when he comes to sell them, one pig out of the three is his profit.

In other words he means this. Supposing when he came to sell his pigs they weighed ten score each—a score is twenty pounds—and they fetched 10s. a score live weight, he would obtain for his three pigs £15; one out of the three being profit, would mean that after paying for his pigs in the first instance, and paying for the cost of the food bought, he would put £5 into his pocket as profit.

If sold by live weight, it means that the weight of the animal is about 25 per cent. more than if sold by dead weight, but of course the price is not so great for live weight.

The satisfactory result of one pig out of three as profit, can only be attained by a man who

understands pigs, and who is a shrewd buyer, and knows the needs of the nearest markets.

In such a case the cottager is able to utilise the refuse from his cottage home and garden, which he cannot make use of in any other way, or more profitably. The small potatoes and leavings of the garden, every drop of dish water and pot liquor, and often in the summer time he can gather bags of the green stuffs growing wild along the hedge rows.

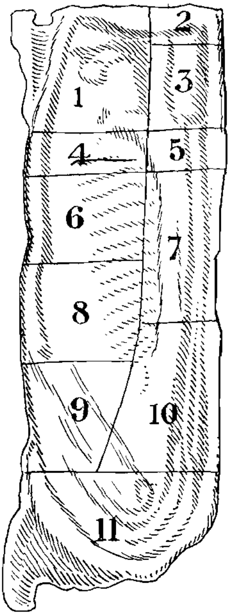
Such a man must watch the price of the feeding stuffs, and get the best he can when the prices of each are lowest; sometimes barley meal, sometimes middlings or sharps, sometimes dry brewer's grains, and sometimes he can get separated milk from the nearest creamery. When small potatoes are very cheap he can buy a few sacks for next to nothing. Sometimes he will scald his meal with hot water, finding that as he is finishing them off as fat pigs, the food will then go further.

There is a common and very erroneous idea that anyone can feed a pig. Anyone it is true, with very little experience can feed a pig, but can they keep it in health and feed it to a profit, and when killed, will it yield the finest quality of bacon?

It is one of the rarest things to sit down to a really good piece of well-fed, well-cooked bacon,

the lean of which is tender and the fat firm and juicy, and which will not run in the cooking.

There is at the present time a demand for lean bacon, but this demand is surely not a wise one. In this climate we require a warming, staying, and digestible food. The lean of much of the bacon we eat is hard and indigestible, and therefore contains little nourishment or warmth, whereas the fat of well-fed, good quality bacon is warming and strengthening, and can be assimilated by the weakest digestion.



SIDE OF BACON.

1, fore hock; 2, end of collar; 3, prime part of collar; 4, top of thick streaky; 5, thick back; 6, middle cut, streaky; 7, prime cut, back ribs; 8, thin streaky; 9, flank; 10, long loin; 11, gammon with corner.

There is not a more strengthening and digestible meal, than a rasher of fat bacon eaten with a slice of brown bread.

The fat from bacon which has been fried, when eaten with bread is excellent and most nourishing. Children are often fond of it and it is very wholesome for them.

Some doctors say that the fat of bacon is as

nourishing as cod liver oil, it is certainly nicer to take and by most of us more easily digested.

Going back to the profit on pigs, the following is a profit and loss account from another cottager and his wife.

In February, 1902, they bought four pigs at £1 each; they fattened three and bred from one, and on December 1st of the same year their net profit amounted to £13; the original cost of the pigs had been taken into consideration and all food bought deducted. The young pigs at the end of the year were not all sold and were valued at 13s. each, a low figure. This man and his wife made their profit in two ordinary cottage pig-stys. But of course they understand pigs and are good practical business people.

The Housing of Pigs.

If you are to be successful with pigs, the kind of sty you keep them in is of the greatest importance. There has been a good deal of controversy lately as to which of the two methods is the best, the loose box, the upper half of the door opening, or the old-fashioned cottage pig-sty.

After seeing the working of both plans, the writer is inclined to think that the old-fashioned cottage pig-sty, is on the whole the best for the

ordinary cottager. It is essential for the well-being of pigs that they get sunshine, warmth, air and exercise, and they should stand and sleep on dry floors.

These conditions are obtained in the cottage pig-sty if it is built in the following manner. The sty must face South, the entrance to the sleeping-place must not be in the middle of the wall but close against the west wall, so that the pigs, when in their sleeping-place, can get behind a large stretch of wall, which will protect them from cold winds and help to keep them warm.

The floor must be well sloped, so that the whole drainage of the sty will run into a channel at the far end of the run, which in its turn will drain into a cesspool outside the sty. This cess-pool should be covered with a wooden cover to prevent the rain falling into it.

Of course such an aspect would not do in a hot climate, it would be too warm, but in our climate, where we get so few hot days in the year, a situation to get the advantage of all of the warmth and sunlight possible, is quite indispensable if pigs are to do well.

If the door is of wood it should be built so that the pigs cannot bite it, as they are particularly fond of biting wood. The old-fashioned cottage pig-stys when well built, well situated, properly floored, and well drained,

have the following advantage over a loose box. The pigs can come out into the run and get all the sunshine possible, which is so necessary to their growth, and the run also gives them a little exercise in the fresh air and so helps to keep them strong on the leg.

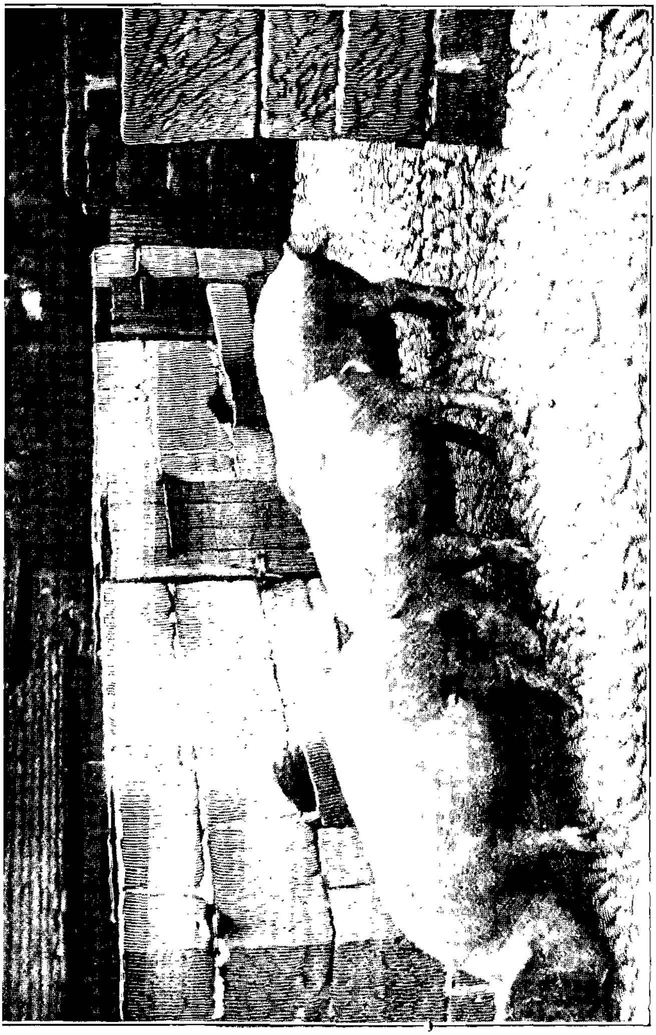
Of course in wet weather, when standing in their runs feeding, they get wet and probably cold, which perhaps does them little or no harm if there are several of them together, and they have a good bedding of wheat straw in their sleeping place on which to lie and dry themselves.

Buildings of both sorts, the loose box and the ordinary sty, have been erected on the writer's estate, and the cottagers who keep and are successful with pigs, are mostly in favour of the old-fashioned, well-built, and well-situated sty. It may be that the plan most approved in this locality would be less suited to another.

How to Feed Pigs.

There are a great variety of ways of feeding pigs. It depends on the price of the respective feeding stuffs, and whether the firms who supply them are within easy distance, so that the delivery need not be an expensive item.

If there are large breweries and creameries near, where they sell brewer's grains and separ-



BACON PIGS.

ated milk at cheap rates, then you would naturally use those valuable feeding stuffs.

If there is a flour mill in the district you will be able to use the offal of the wheat,—Bran, Sharps, and Pollards in a larger proportion than you would use them if no mill was near.

If you are so unfortunately situated as to have no brewery, creamery, or flour mill near, then of course you can use that excellent feeding stuff, Barley Meal, and occasionally Maize Meal.

All successful and experienced feeders of pigs agree, that Maize Meal ought to be used very sparingly. Especially ought it to be used sparingly as food for the confined pig of the Cottager, as by reason of its heating nature, it will soon cause the pig closely confined to lose health and strength.

Some exhaustive experiments have been made in Canada, as to the best system of feeding pigs in order to obtain a firm bacon, with a suitable proportion of lean and fat intermixed, and to secure a continuous and profitable growth. It has been found that a food consisting of equal proportions of Maize Meal, Pea Meal, and Oat Meal, has the most nearly obtained these results.

These experiments have further taught, that when the food consisted of half Maize Meal, the pork was inclined to be soft, and further that

when Maize Meal alone was given, the fat was soft and the bacon of an inferior quality.

In this country we have found that perhaps the most successful method of feeding, is Barley Meal mixed with Skim Milk and some Cooked Potatoes, and a judicious use of Bran and Brewer's Grains, and in the Spring, Summer, and Autumn the careful use of green stuff, grass, salt, and wood ashes.

If pigs are fed entirely upon meal, they are said not to grow in proportion to their bulk, and therefore they tend to put on more fat than the buyer at the present day requires.

The Bacon made from pigs fed on skim milk alone, is inclined to softness and lacks quality.

Many cottagers feed their pigs as follows:—they mix Sharps or Middlings with the wash, and add a few cooked potatoes. A few weeks before marketing the pigs, they add to this feed a little Maize Meal and Bran.

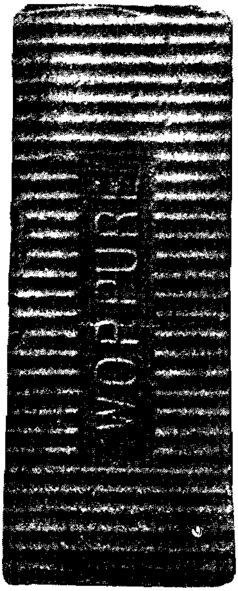
The meal and bran is scalded with hot water. This they say makes the food go further and does the pigs most good.

Some are in favour of feeding the pig twice a day, whilst others think that feeding in less quantity three times a day is the best plan.

A cottager who won the first prize at the local show, with a pig weighing 18 score 10 lbs. at ten months old, gives the following particulars of his

method. He says "never feed small pigs on Maize Meal, as it overheats the body and causes them to go off their legs, especially is this the case where the pig has only a small sty."

He has always fed his pigs on Sharps, which he stirs in the wash. If he cannot *get wash every day*, he gives them a small piece of oilcake soaked in water to take the place of the wash, and then adds the Sharps, this he says keeps them in a very healthy and growing condition.



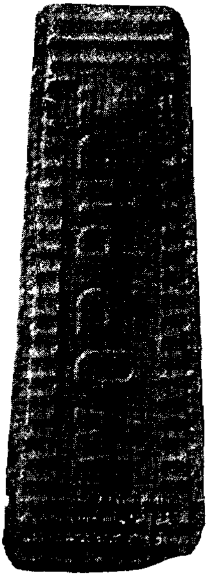
LINSEED CAKE.
(Reduced reproduction from a photograph.)

If the wash is thin, he puts into it a little coarse bran to thicken it, and to this adds the Sharps. He feeds in this way until his pigs are eight or nine score in weight, and if he wishes to bring them up to ten, twelve, or thirteen score, he adds a little Maize Meal to the food during the last six or seven weeks.

If he wants them still heavier, he delays adding Maize Meal till they are twelve score or so, feeding with Sharps, Wash, Bran, and a little Oilcake, and when they have

reached twelve score he begins to add his Maize Meal.

In the Spring, Summer and Autumn, he gives them grass, sods of earth, green stuff, salt, wood ashes, *and a handful or two of cinders. This is* in addition to the usual food, as he thinks his pigs require it in order to keep them in good health and condition.



COTTON CAKE.
(Reduced reproduction from a photograph.)

As the result of his experience he prefers feeding his pigs on Bran, Sharps, Wash and Potatoes to any other food.

The Sharps as you know has more flour in it than there is in Pollards, and Pollards has more flour in it than there is in Bran.

What is the most profitable age to sell a pig, or in other words, up to what age does a pig turn the food it takes into the greatest weight of flesh?

Some feeders think that after ten score is reached, the profit is not so great as it is up to that weight. But if a pig is meant for home consumption where there is a large family, and the meal purchased can be helped out by the garden and the house leavings,

it pays to keep a growing pig up to 18 score or more.

If a pig is of the right fattening sort, the heavier it gets the greater is the fat in proportion to the lean, and the fat too is more nutritious. But if you are fattening for the market, then you must take into consideration what the buyer will give you the best price for.

In the Northern, Midland, and Manufacturing Districts, a big pig will sell well, whilst in the Southern Counties it would hardly be looked at.

The bacon curers in this country, require a pig that does not weigh more than about 10 score live weight, and a pig that when cut up does not show an excess of fat.

To sum up, the principle to aim at in feeding a pig, is not to half starve it at the beginning and then cram it at the finish, but to deal with it on the same principle as you would deal with any animal, if you are to feed it to a profit, namely, to fatten it slowly as its strength, health, and constitution will allow. The fattening must be a gradual process, nothing must be done suddenly. Growth and fat ought to proceed together.

This gradual building up of a pig—that is, slowly fattening it—has this advantage, that when they get to a weight that the pork butchers require, and the price that the pork butchers

give is a good one, you can sell them as porkers. If the price that the pork butchers offer you is a low one, that is, if the pork market is against you, then you can keep your pigs and feed them for bacon, and the price that you obtain for them as bacon pigs, may be more profitable than the price that you would have sold them for as porkers.

This must of necessity mean very careful attention and knowledge. If a pig begins to fall off in weight, it means a loss to the fattener.

Do not feed your pigs with sour wash, because it causes indigestion and therefore checks their growth. Get rid of your pig tubs and have instead a bucket, into which you can empty the wash, and let this wash be used up each day.

Never starve your pigs, and do not overfeed them. If you feed them two or three times a day, only give them just what they will eat up cleanly. To give them more than this is to waste the food, and it will do the pig more harm than good.

Let the feeding troughs be of iron and wash them out each day. If you wish to make the bones of your pigs hard and keep them well on their feet, let them stand and sleep dry. And whenever you can get wood ashes, give them a supply.

The Sort of Pig to keep.

In selecting a breed of pigs you must study the needs of the nearest market, or the market that gives you the best price. If the market requires a black pig, then breed a black pig, if a white pig, then breed a white pig.

If the demand is for very large bacon, somewhat lean in quality, then keep the Large Whites. If you wish for a smaller pig and a pig that the pork butcher thinks well of, there is the Middle White.

If you require a pig with small joints, which puts on fat quickly, there is the Small White. These three white breeds are included in the term Yorkshires.

The good-looking black Berkshire is a useful pig for the cottager to keep in his sty, the quality of its meat is excellent, and the joints of bacon and pork are of medium size, which suits the requirements of the present day market.

The Berkshire possesses the useful quality of turning the food that it eats into a profitable amount of flesh. This pig however, in many cases, by over coddling, over feeding, and in-breeding, has developed a tendency to put on too much fat in proportion to the lean, and what is much worse, its constitution in some cases has become delicate.

In order to correct these weaknesses, some breeders are crossing it with the Red Tamworth.

The Tamworths are an old-fashioned breed of pigs, long in the snout, big in the ear, bony and angular in frame, and of a red colour; it is said the breed was fixed in Staffordshire.

This pig possesses a good constitution, is a large and not dainty feeder; but the food that it consumes instead of turning into an excess of fat, rather turns to an excess of lean.

This is why the Tamworth pig is used to give its characteristics to other breeds.

Messrs. Harris, the well-known bacon curers, when buying pigs, require that the weight should be about 200 lbs. live weight, and that the lean and fat be evenly mixed; they recommend, in order to get these conditions, a cross between the Large White and the improved Berkshire.

Some of the same litter will always turn out more profitable than others. They will grow quicker, put on flesh more easily and steadily, and will keep in better health. Keep your eyes open for such pigs, and if you breed, breed from this line of descent. Give a shilling or two more for the biggest pigs of a litter, the shilling or two extra will be well spent.

Don't be tied down to a breed of pigs, but select from a pure breed, or cross-breed, or from any strain of pigs that you have heard do well,

and which you have noticed for yourself have fed well, lived healthy, and sold at top market prices.

No matter what experience you have had with pigs, don't be above taking advice, compare your neighbour's experiences with your own, he is sure to have noticed a point or two that may have missed you, and you will probably have observed something that has missed him. There ought to be no room for suspicion or jealousy amongst people working the land and keeping live stock. There may be some excuse for it between two men trading in the same articles in the same town, but there is no excuse for it between agriculturists.

Co-operation, combination, and mutual self-help is what we workers in the country need.

COTTAGE POULTRY.

FOR the following reasons every Cottager ought to keep a few head of carefully selected Poultry:

Firstly—For the sake of the profit which can be made.

Secondly—Because Poultry manure is so valuable for application to the Garden.

Thirdly—Because feeding, watching, and tending them is so interesting and such a useful training for children.

Let the girls of the family be taught to look after the Poultry, and let this be their special work.

Encourage them to point out and talk over what they have noticed when watching the birds. Let them notice which birds grow the quickest, which are the best feeders, and which are the most abundant layers. Let them further notice the variations in their different dispositions, for no two birds' characters are quite alike.

Encourage them to handle the Poultry gently but firmly. The birds will soon gain confidence,

and then they will not be much distressed at being handled.

Let the girls of the family note the number of eggs each bird lays, and when a setting is required, only set the eggs of those birds which have laid the greatest number of eggs, especially the eggs of those birds that have laid the greatest number during the cold weather, and which have feathered the quickest, grown the fastest, eaten the best, and have borne confinement the most contentedly.

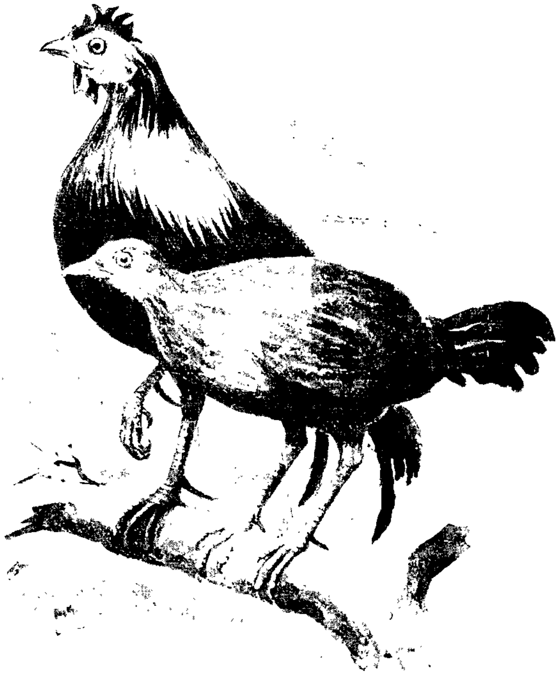
All this of course requires a great deal of observation, patience, thought, and memory. *It is of no use to carry it out one day and neglect it the next.*

The desired result can be arrived at much more easily by a Cottager, who keeps a small number of birds in confinement, than by a Farmer who keeps a large number of birds wandering over his Farm.

In giving a country girl a true and practical knowledge of Poultry, no training could be better than this; and when she has learnt these lessons for herself, and learnt what her neighbours have to teach her, and studied a little from books and papers, she will have trained herself to become a successful Poultry keeper.

The knowledge gathered from your own obser-

vation, work, and thought, is more valuable to you than any theoretical knowledge that you may learn from books.



THE INDIAN JUNGLE FOWL.
The probable ancestors of our modern fowls. About the size of a bantam.

By all means add to and check the knowledge you have acquired for yourself, by reading what others have written and listening to what other competent and practical people have to tell you.

Housing Poultry.

Cottage Poultry must be kept in confinement, for if allowed to wander, they will make sad havoc with your neighbour's gardens and your own.

If you have a large garden, and can spare a small piece of it, the best plan by far is to confine your poultry, by means of a movable Poultry House (see pages 272, 273), to which should be attached a movable wire run.

The movable house can be bought for between £3 and £4 from any of the well-known builders; or you can make and fix it yourself for very much less. The run ought to enclose about twelve feet square and be from six to eight feet high, with about a foot of the wire at the top bent inwards.

If you notice Fowls, they very rarely get out of a place by a clean fly over, like a bird, but partially fly and partially scramble up the side of anything that confines them. So if the top of the run is bent inwards a foot or so, it will keep many Fowls in which would otherwise get out.

Place the House and wire run on a piece of unoccupied ground; and after a month or two move it on to another piece of ground which you do not intend to sow for a time.

Cultivate and plant the first plot from which you have removed your house and run, and carry this principle out all over the garden.

If you manage the house and wire run in this manner, you will be constantly giving your Poultry fresh ground, and the moving of the house from place to place, will cause the Poultry to manure the garden and pick up every insect, insect egg, and chrysalis that may happen to be there, and moreover, they will clear the ground of all seeds of weeds.

So the movable house and run effects a three-fold purpose: 1st, it keeps the birds healthy; 2nd, it manures the garden; 3rd, it keeps the garden clear of insects and weeds.

In buying or building a movable house, there are certain points in connection with it, which are very essential to the health and success of your birds.

The raised wooden floor must be movable, and made in two parts, so that it can be taken up easily, to be scrubbed.

The nest boxes must open from the outside, so that there need be no necessity to go inside the house to collect the eggs.

The House must be well lighted and ventilated, and, above all things, kept free from draughts.

A good system of ventilation is by means of a slight opening just under the roof, where the upright sides and sloping roof meet.

Underneath the House there should be a high and roomy shelter, which in bad weather will

allow the birds to go under without touching their combs.

There is nothing that distresses Poultry more than getting their feathers wet. You must have noticed that directly a shower of rain comes on, every bird will make for the nearest shelter.

Under the shelter of the movable house, some dry dusty ashes and dry dust from the road should be placed. This will provide the birds with a Dry Dust Bath, in which they can fluff themselves, when their instinct tells them that they require protection and cleansing from insect pests.

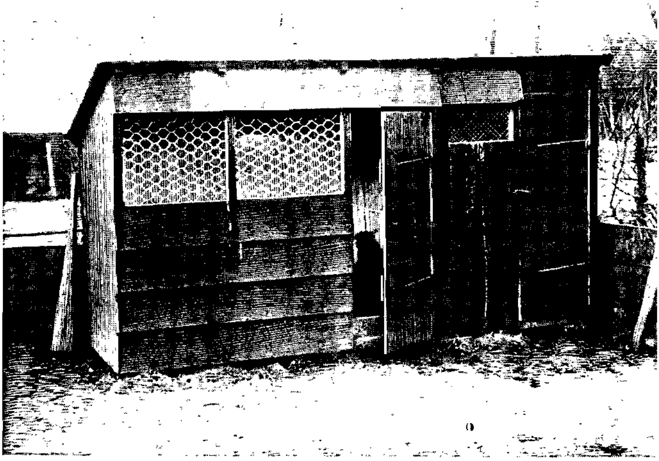
For the floor of the house there is probably nothing better than moss litter, laid down about six inches thick.

Moss Litter keeps the feet of the birds dry and the house sweet, and is a protection against insect pests. If it is raked over several times during the week, there is no need to change it for several weeks, and when it is changed and mixed with garden soil it makes an excellent manure.

If Moss Litter is not to be obtained in the district, except at a prohibitive price, get some dry gritty earth, and spread it an inch or two deep over the bottom of the house.

In both cases if the bedding should get wet, remove it at once and put in its place a fresh

supply of dry bedding. It is important to keep the feet of the hens dry. It is a good plan after removing the litter to sprinkle the floor of the house with wood ashes. The ashes not only purify the house, but also add considerably to the value of the manure.



HOUSE FOR EIGHT BIRDS.
3 feet 6 inches square. Height in front 5 feet 6 inches, height at back 4 feet 9 inches. Covered run 8 feet by 3 feet 6 inches.

One of the most successful rearers of Poultry states that no hen can lay an egg if its feet are wet, and he gives a scientific explanation of the reason why, which explanation is too technical to come within the purpose of this book.

In order to keep the feet of his birds dry, the

authority mentioned erected, in his open runs, perches about a foot from the ground, which he says are always occupied by the fowls on damp mornings.

Give the Movable Poultry House a coating of Tar inside and out. There is nothing that preserves wood from the wear and tear of weather better than Tar. Tar keeps wooden buildings air and water-tight. Besides which, Tar is the most healthy and the best disinfecting application that you can use, and the smell is by no means a disagreeable one.

The inside of the Poultry House ought to be white-washed three or four times a year; the perches ought to be broad, movable, and yet firm when fixed in their place; they should be taken down constantly and well scrubbed with soft soap and water, and should not be more than two or three feet from the ground.

Whenever possible let the front part of the house and run face the south, never by any chance let it face north.

Give the birds all the sun and warmth you can, and shelter them as much as possible from high winds.

Perhaps you may not be able to spare the space in your garden needful for a poultry house and run. In that case you must have a fixture.

If there is a wooden paling in your garden facing south, let it form the back of the fixture.

If you examine the poultry house in the illustration, you will see that it consists of a sleeping place and a covered run.

Macmillan's Country Reader Book III.

SILVER GREY DORKINGS AND POULTRY HOUSE.

The boards running along the front of the run are to protect the birds from the rain when driven before a high wind, and are a protection from the wind itself.

This wooden protection ought to be movable, so that it can be easily taken down on warm, sunny, calm days.

Be careful that the whole fixture is built upon a dry foundation, and that it is well protected from rats.

The bottom of the house and run is best covered with several inches of Moss Litter. If the bottom of the run is left bare, then the best plan is—when it is foul—to remove the soil of the run for several inches in depth and throw the saturated soil on to the manure heap, replacing it by a covering of fresh earth from the garden. Cinders and wood ashes thrown in the run from time to time are an advantage.

What Birds to keep.

It would be unwise to lay down a fixed rule as to the best breed of poultry for any Cottager to keep.

The Conditions of the Soil, Climate, Aspect, and Market vary in different parts of the country, so that in one part of the country one breed of fowls will do best, and in another part some other breed of fowls will do best.

The breeds that have been bred especially for egg laying, and therefore make bad sitters and mothers, are Leghorns, Minorcas, Andalusians, and Hamburgs.

These birds, are of a nervous temperament, quick, alert, easily frightened, readily taking to

flight. Some of them will do well in enclosures if not too crowded. They come to maturity early.

These egg breeds have been produced for laying, at the expense of sitting, and are really egg producing machines.

BLACK MINORCA HEN. (Weight about 6 lbs.)

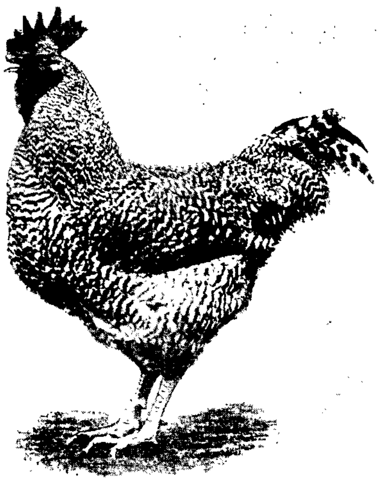
The wild jungle fowl probably brought up two sittings of chicks a year, laying about 30 eggs in all, and it is from these birds that our domesticated fowls have descended.

WHITE LEGHORN HEN. (Weight about 6 lbs.)

By selection, housing, and feeding, the average has been brought up from

80 to 100 eggs per head of fowl per annum throughout the country.

Some strains of hens will produce annually 200 eggs per head. A Leghorn has been known to lay 292 eggs in a year.

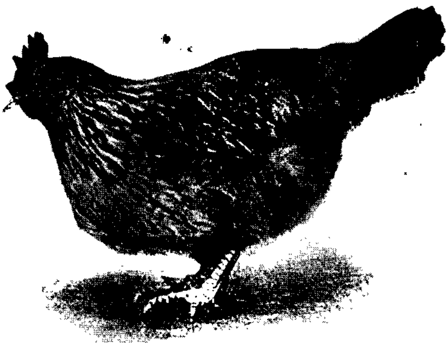


PLYMOUTH ROCK.
(Weight 9-12 lbs.)

Among the meat breeds two stand out pre-eminent, namely, the Indian Game, and the Dorking. The former is the hardier and is richer in flavour; the latter grows rather more rapidly and has more delicate white flesh and legs. The cross between the two makes one of the very finest of table birds. Other breeds share, in a lesser degree, the meaty qualities of the Indian Game and Old English Game. There are several breeds which make good table birds; such as the Orpington, Langshan, Houdan, and the Faverolle. There are various useful all-

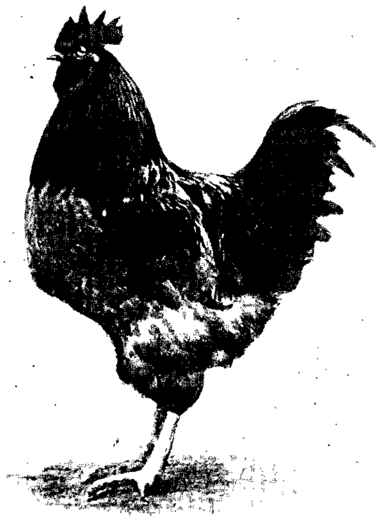
round or General Purpose breeds, that are widely popular and very serviceable, which produce a fair number of eggs. The chickens of these breeds grow quickly into fine, tender-fleshed birds for the table.

Amongst these breeds are the Plymouth Rock, Wyandotte, Faverolle, and the Orpington. Some good crosses for general purposes are the Orpington cock and Faverolle hen; the Indian Game and Dorking hen; and the Indian Game and Orpington hen. Brahmas and Cochins should be avoided, for though they grow to large size they are very inferior in flesh qualities; even the size is deceptive, consisting as it so largely does of bone, offal, and internal fat, instead of juicy meat, and in addition are comparatively poor layers. A Game Fowl is on the other hand always really larger than it looks.



DORKING HEN.
(Weight 9-10 lbs.)

However, all their hardiness and handiness may be had, and had more economically, by anyone who will make it a rule to secure a good pure bred cock of one of the egg-laying or meat-producing breeds mentioned above, and breed from him with the best hens he has or can readily obtain. It is astonishing how one good Leghorn or Hamburg cock will raise the yield of eggs during the following season, or how one Indian Game or Dorking cock will improve the quality of the chickens for the table if mated with some of the hens one may happen to have.



BUFF ORPINGTON.
(Weight 9-10 lbs.)

Egg and Meat Production.

If you intend your fowls to be profitable egg producers, it is necessary that the young chicks should hatch out as early in the year as possible, so that they begin to lay in October, and continue laying during the Winter, when new-laid eggs always fetch a good price.

BUFF ORPINGTON HEN.
(Weight 7-8 lbs.)

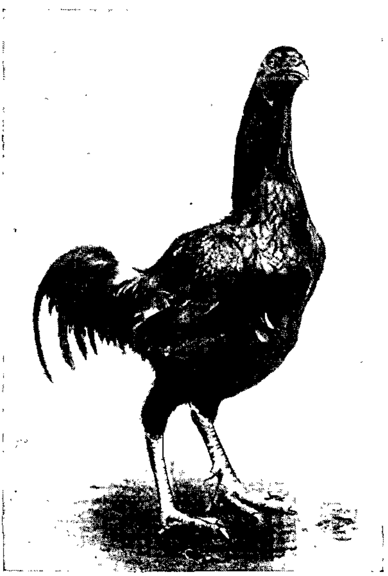
The following year, when they cease laying, some Poultry keepers consider it the best plan to fatten them up for the Market.

They are then young birds, and with a little extra care in feeding a few days before they are killed, they will make excellent table birds.

No bird ought to be kept more than two years and three months, as after that age the number of eggs laid will diminish.

If you wish to get the best price for your fat

Poultry, confine them in a cage for a week or ten days before you kill them, and feed them with meal moistened with skim milk, or the milk that may be left from your previous day's supply, mixing with it a little finely chopped fat or meat.


INDIAN GAME.
(Weight 8 lbs. and upwards.)

The Surrey fatteners use the whole oat, which is ground into a flour between the stones of a mill; this oatmeal is mixed with skim milk into the consistency of a thin porridge, and to it a little fat is added.

They find that the birds will feed naturally, out of the troughs placed before their barred wicker cages, for about ten days, they then go off their feed, and then it is that the birds are artificially crammed by the cramming machine.

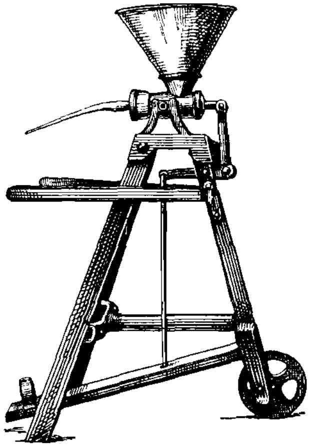
When marketing the birds attend to their appearance, see that they are properly plucked,

dressed and shaped, giving to the whole bird as round an appearance as possible.

See that the eggs are collected every evening, and when they are sent to Market they should be as nearly the same size and colour as possible and look spotlessly clean.

A uniform basket of eggs will fetch a better price than a basket of eggs of all sorts, shapes, sizes, and colour.

All eggs of inferior shape and colour had better not be sent to Market, but be kept for home use.


CRAMMING MACHINE.

Feeding of Fowls.

If your fowls are to lay the greatest number of eggs, it is important that only just sufficient food should be given them, which they can eat up readily, and the food should be well scattered about, so that they have to search industriously to find it.

It is perhaps best to give them a warm feed of moist meal,—Barley Meal, Middlings, or Sharps, —mixed with a few cooked potatoes in the morning; scraps from the house in the middle

of the day, and some whole grain before they go to roost. Good oats, or wheat is perhaps the best.

A valuable food for rearing young poultry is boiled maize, which should be broken, after boiling, in a hand mill.

Poultry should have a supply of green food, grass, clover, or a cabbage hung up which they can pick at, or any green stuff that there is to spare from the garden.

In the winter when green stuff is scarce, beet-root, or mangel, makes a good green food for fowls; these roots can be easily raised in the Garden, and kept in fresh condition in any ordinary cool cellar all through the winter. They may be prepared by splitting the roots lengthways.

The Fowls will then pick out the fresh pulp from the cut surface.

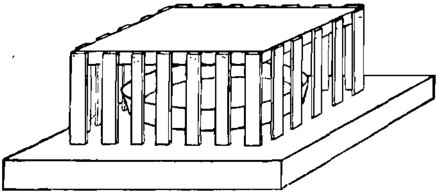
It is very necessary that Grit should be given in order to help the Fowls to keep in good health. The grit should be about the size of a small grain of wheat.

The grit is best kept in small boxes nailed to the sides of the run; crushed oyster shells will supply lime, and so make the shells of the eggs hard.

Remember that a plentiful supply of clean fresh water is very necessary if Fowls are to be

kept healthy. The illustration shows an excellent plan for keeping the drinking water clean.

For laying hens, especially for old hens, a little salt mixed with the food will help them to lay the greatest number of eggs.



The fowls put their heads through the bars to drink, and cannot dirty the water or milk.

Kill any bird at once which shows symptoms of declining health; it is waste of time trying to doctor fowls.

In conclusion, the secret of success in the keeping of Poultry, is not to keep a single bird which will not yield a profit over and above the cost of its keep.

This can only be accomplished by replenishing your stock from those birds which have laid the greatest number of eggs, lived the healthiest and most contented lives, and which when fattened for the market have put on the greatest quantity of tender, white flesh on the least amount of food.

HARES AND RABBITS—A COMPARISON.

HARES and Rabbits are said to belong to the same family. From what we know to-day it is probable that a long time ago, there were ancestors common to both Hares and Rabbits, and that different conditions compelled one line of descendants, the Rabbits, to protect themselves by seeking shelter in holes underground, and another line of descendants, the Hares, to protect themselves by concealment and speed.

Whether this is right or wrong, it is very interesting to note the different characteristics of the Hare and Rabbit, and to show how these different characteristics are suited to their different modes of life.

For instance you know that a Hare does not make a burrow, or hole, but a form—the form being a place of concealment or shelter, amidst some long herbage. During the daytime the Hare remains in its form, leaving it at nightfall, often returning to it after the most extensive

travels. This is the reason for the expression, "The Hare returning home to die."

Of course Hares make these forms to shelter themselves from the cold of winter and the heat of summer, and also to conceal themselves from danger. Sometimes they will remain in their forms till you almost trample upon them, whilst at other times, especially in bad weather, they will take to flight long before you can get near them.

For some reason or other they are said to be more wild in the afternoon than in the morning.

On hearing an unusual sound a Hare's first impulse is to sit quite upright with ears erect.

Then seeing you, it endeavours to conceal itself by stretching its body against the ground, with its long ears lying flat along its back. If it finds that this dodge does not answer it at once takes to flight, and the length and strength of its hind legs, and the suppleness of its body, enables it to instantly get into its rapid stride and long bound.

There is probably no animal that can get to its full pace so rapidly as a Hare. Its brownish-red colour, is a wonderful help to concealment amidst the Plough land and foliage where it generally lives.

The Writer remembers once watching a Hare. It ran rapidly over the green grass, seeming to

know that the colour of the grass afforded it no protection. But on coming to a piece of plough land, it seemed to know that the plough land was of the same tint of colouring as its own reddish-brown body, and so down it crouched and it was difficult to see which was the Hare and which was the plough land, so beautifully did the tones of colouring harmonise.

A Hare has from three to five young at a birth, and has several litters during the year. When the young are born they are covered with hair and fur and have their eyes wide open, and can soon shift for themselves.

If the young Leverets were born above ground blind and defenceless like the rabbit, what chance would they have of living?

A Hare has young at a year old.

Therefore speed, the power to dodge and turn, colour, alertness, quickness of hearing and sight, especially the sight that can look behind and see every movement of a pursuing enemy, has enabled the Hare to survive many dangers.

Now consider the Rabbit. It seeks protection in underground burrows. The young are usually born or littered, in a shallow burrow scratched, or thrown out, by the Doe, usually in the open in some quiet arable or pasture field. The reason for the Doe seeking these more open spots is that they are less frequented by other

Photo. Charles Reid.

YOUNG WILD RABBITS.

Rabbits, and the young are less likely to be found and disturbed, and perhaps devoured, which might be the case in a spot more frequented by Rabbits. There is only one entrance to this underground chamber.

The Doe makes a nest of dry grass and leaves, which she carries into the burrow, and lines it with her own fur, which she pulls out with her mouth from the under parts of her body. In order to give the little ones greater protection from danger, the Doe—until her young can see and are able to get about a little—fills in the entrance to the burrow with earth, and visits her blind and defenceless little ones only under the cover of night.

Rabbits seek protection from danger by disappearing into holes and burrows, which they have scratched for themselves in the soil. As a consequence there is not the same need for them to travel so fast, or to be so alert as the Hare, nor is their greyish colour such a protection to them, as the reddish-brown colour is to the Hare.

Rabbits, as you know, live in large communities, and therefore you may be sure they have to assist each other by obeying some kind of primitive Rabbit law. Take two instances which we know of: At the approach of danger a Rabbit will thump loudly on the ground with

its hind legs; this is a signal of warning to the other Rabbits of the community that danger is near.

When a Rabbit is frightened it rushes headlong to the nearest rabbit hole, and in doing so shows very distinctly the white underside of its tail. This is thought to be a danger

Photo. Charles Reid. WILD RABBITS.

signal to the other Rabbits to tell them to be on the alert, and is perhaps a guiding signal to a place of safety on the approach of an enemy.

As a rule the animals or birds that live in pairs, or solitary, are much more difficult to tame and domesticate than animals or birds that live together in herds, flocks, or communities.

Hares and Rabbits are no exception to the rule. Hares as you know only live in pairs, therefore they are much more difficult to tame and domesticate than Rabbits, which live in communities.

Photo. Charles Reid. DOE AND LITTER OF YOUNG RABBITS.

Domestic Rabbits.

The Domestic Rabbits have been bred from varieties of the wild rabbit. Breeders have noticed slight variations in the offspring from the parent, and have bred from rabbits possessing these variations, and have followed this prin-

ciple out generation after generation—litter after litter—till at last a distinct breed becomes established, which will breed offspring like the parents. They breed true, as the expression is.

For instance, a Wild Rabbit's ears are pricked or upright. Some Rabbits with upright ears

LOP-EARED RABBIT.

were originally caught, confined, and bred from. The Breeder probably noticed that one or more of the offspring of the original strain, had ears which were not so upright or pricked as the ears of the parents. It then occurred to the mind of the breeder that he would like to fix a variety of Rabbit with Lop-ears, and so he bred only from the Rabbits whose ears he noticed

were inclined to be more lop-eared than the rest. The Breeder thus breeding and selecting, little by little, at last fixed a variety of Rabbits with Lop-ears, which had offspring whose ears, instead of being upright or pricked, are very distinctly lopped.

It was this principle of selection, combined with feeding and housing, that has probably produced all the tame breeds that are known to-day.

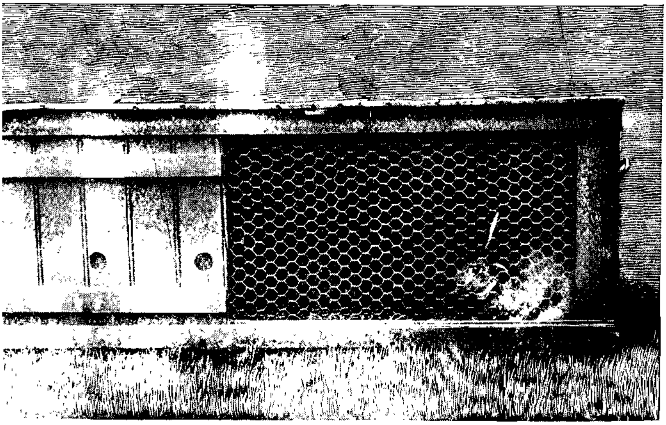
If you have a piece of grass that is doing next to nothing, the herbage of which is a bit coarse, place on it movable rabbit hutches.

These movable Hutches have a small closed-in sleeping or breeding compartment at one end, and a hole through the partition of the sleeping place leads into a larger run. The run has small meshed wire fixed along the bottom, small enough to prevent the rabbit getting its legs through it, but large enough to allow the herbage to come through the meshes of the wire.

The Hutch opens with a lid at the top. It has two handles, one at either end, so that to move it you lift up one end of the Hutch by the handle and place the wire bottom on a fresh piece of grass, and having done this lift the other end by the handle, till the whole Hutch is placed upon a fresh piece of ground.

The Hutches are very light, so that a small child can move them about.

If a handful of Crushed Oats mixed with a little Bran is given to them each day, and the Hutches are moved three times a day, the Rabbits will obtain a living from the grass.



MOVABLE HUTCH.

Once a week take out the movable wooden floor which forms the bottom of the sleeping place and give it a good scrubbing, being careful to dry it well before replacing it.

If there is not a piece of ground at your disposal, you must keep your Rabbits in a stationary Hutch. Obtain a full-sized Valencia raisin box, or a good sized Champagne case and bore some holes in one side for drainage,

making this side the bottom of the Hutch. Nail some wire along three parts of the open side, where the lid has been, and at the other end of this open side make a door that will open and shut.

The Hutch must be kept in the dry, and well off the ground. A good plan is, to drive four posts into the ground and stand the hutch securely on them. If the hutch is placed out of doors, let it be in a spot sheltered from the cold winds, and it should be rendered water proof.

For bedding use a sprinkling of clean, fine, Sawdust, and on it place some good sweet Hay. Hay serves the twofold purpose of food and bedding. The Sawdust keeps the Hutch clean and sweet, absorbs all moisture, and is a prevention against fleas.

During the winter time, in the morning feed, give a portion of Swede, Turnip, Mangel, or a piece of Carrot. In the evening, feed the Rabbits at about seven o'clock with Crushed Oats and Bran, or Whole Oats. The following day for the morning feed, give a handful of sweet Meadow Hay or Clover Hay, Oats, Turnip, Beetroot, or Carrot, and in the evening Oats may be given again.

This diet may be varied by giving some Peas if the weather is cold, but they should be given sparingly. A supper of porridge made of Maize

Meal scalded, if not too thin or too hot, makes a good and wholesome meal.

As a change Barley Meal may be beneficial. A feed of Potatoes or clean potato parings well boiled, with the water drained from them, makes an excellent food once a week for variety; the parings should be mixed with Maize or Barley Meal.

Brewers' Grains may be used as a food, but they should be given sparingly, and not more often than once a month. They should, however, be well squeezed in order to make them as dry as possible, and should be mixed with Maize Meal.

The great principle with confined rabbits is to feed them in great moderation; twice a day is ample, and they should have a very varied diet.

If you give them green stuff, give them carrot tops and the growths from the field and hedgerow—Cow-parsnip, Plantain, Sow Thistle, Dandelion, Clover, and Vetches; be careful in giving Cabbage and Lettuce, they should be used only in moderation.

Confined rabbits, if they are to be kept in health, must only be fed with a small quantity of green food each day, and it must be given them perfectly dry. To feed with wet green stuff is fatal. A few leaves of the Ash or sprays

of Broom are of benefit to young rabbits when they appear distended or blown. This state is generally spoken of as "The Pod."

Breeds of Rabbits to keep.

Rabbits increase at an enormous rate; at six months old they will begin to have young, and will breed from four to eight times during the year, having five to seven and eight in each litter.

It is reckoned that the descendants from one Doe, if left undisturbed and these in their turn are allowed to breed, will in the course of four years reach the enormous total of 1,274,000.

The natural enemies of the Rabbit are the Owl, Hawk, and the Weasel family, especially the Stoat. If these animals are exterminated the Rabbits must be kept down strictly by shooting, and especially by ferreting during the winter.

A few Rabbits were once innocently imported into Australia. Their natural enemies being absent and the soil, climate, and vegetation suiting them, they have increased in such multitudes, that no device yet discovered can keep them in check or lessen their number, and they have swept bare large areas in that country.

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Even in this country, if they are not kept severely in check by their natural enemies, or

by man, they will soon multiply in enormous numbers and devastate large tracts of country, bringing ruin upon those dependent on the soil for a living.

There are many varieties of the Tame Rabbit. The best known are: The Lop-ear, Himalaya,

Photo, Charles Reid. BELGIAN HARES. (Weight from 7 to 11 lbs.)

Angora, Silver Grey, Dutch, and the Belgian Hare.

It is now stated by competent authorities that the Belgian Hare is the best for table use, and the most profitable to rear and market.

The Belgian Hare Rabbits are large and handsome animals, weighing from 7 to 11 lbs. They

have prick ears and are of much the colour and appearance of the Hare. They do well in confinement, and do not eat so much in proportion to their size as some of the smaller breeds. Wild Rabbits may be greatly improved by turning out amongst them some Belgian Hare bucks.

Most rabbits are profitable if well managed; there is no kind of herbage which they will not eat. Grass, weeds, and any kind of herbage which may be gathered from the roadside, with a little dry food, will keep them well and fat eight months in the year. A few Turnips or Mangels, Dried Weeds, Leaves, or Grass, stored away in the Summer, will keep them through the winter.

In country districts Rabbits can be kept on the waste of the hedgerow, field, and garden, all the year round at no cost, except the expense of a few Crushed Oats and a little Bran.

PIGEONS.

In different parts of the world there are to be found nearly 150 varieties of a group of birds called Pigeons, but in this country there are commonly found only four varieties. The large Wild Pigeon, or Ring Dove; the smaller Wild Pigeon, or Stock Dove; the Rock Dove, from which it is said that all our domestic Pigeons have descended; and the Turtle Dove, which arrives in this country early in May and leaves us again in September.

Pigeons lay two white eggs at each sitting, and rear several broods of young during the breeding season.

The nestlings, or Squabs as they are called, are quite blind, naked, and helpless, instead of being covered with down and able to run about and feed themselves as soon as hatched, like chickens.

Pigeons live in pairs and are said, unless one of them dies or is killed, to be faithful to each other for life.

The parent pigeons feed their young by softening the hard food they swallow, mixing it with a kind of milky fluid which is secreted in the crop, and bringing it up and disgorging it into the mouth of their young.

The Pigeon drinks in a different manner to all other birds. Instead of putting its beak into the water and throwing its head back into the air, to enable it to swallow, it keeps its bill in the water till it has quenched its thirst.

The only note the Pigeon seems to utter is the well-known cooing sound.

The Pigeon flies with great rapidity and strength, and can fly for very long distances without resting or perching.

Their feet are so constructed that they can either perch like the Thrush, or walk like the Starling or Pee-wit, but they never hop like the Chaffinch.

Greater Wood Pigeon, or Ring Dove.

Is a large bird, and is well worth noticing because of its lovely colouring, its rapid, strong flight, and its clever ways of avoiding danger. Sad to say this beautiful bird does harm to the Farmer.

When the Wheat is in the ear, the Wood Pigeon will travel from the nearest wood and fill its crop with the grain. Nearly two hand-

fuls of grain have been taken from the crop of one of these birds.

You must have noticed that by the time the

POLE LOCKER OR COT.

Wheat begins to ripen, storms of wind and rain will often lay certain portions of it flat on the ground. It is these portions of flattened grain

which the Wood Pigeon singles out, so that it may the more easily pick the grain out of the ear.

When there is no portion of the crop on the ground, these clever birds have been noticed hovering with outstretched wings above the standing crops, and then suddenly dropping they carry with them a number of stalks, the grains of which they eat at their leisure.

The Wood Pigeon may do some good by feeding on harmful weeds, especially the seeds of the Charlock, but owing to its numbers and the ease with which it can obtain wheat from the fields, the good is out-balanced by the harm it does.

In consequence of its rearing three broods in the year, being a very hardy and wiry bird, and building its nest in difficult situations, its numbers are not easily kept in check.

Probably the chief reason why the Wood Pigeons and Sparrows are increasing in such numbers, is owing to the destruction of the Birds of Prey by the game preservers.

You must have noticed when observing the Wood Pigeon, how quickly it perceives the slightest sign of danger, and how rapidly it can change the direction of its flight to get out of harms way.

With the exception of those times when the

Photo. Charles Reid.
THE GREATER WOOD-PIGEON, OR RING DOVE, AND NEST.
(Total length of bird about 17 inches.)

birds are stealing grain from the ripening corn-fields, and during severe frosts, the flesh of Wood Pigeon is very good to eat.

Lesser Wood Pigeon, or Stock Dove.

The Stock Dove can be easily distinguished from the larger Ring Dove, by its lighter and more elegant body, and its manner of rising on the wing. The Wood Pigeon or Ring Dove

when rising on the wing makes a flapping noise, but when the Stock Dove rises on the wing it hardly makes a sound.

The Stock Dove is also darker in colour and smaller in size than the Ring Dove. The Stock Dove walks on the ground with ease and grace, progressing by short steps like a tame Pigeon, every now and again nodding its head as it walks.

When seated on a bough or branch it sits rather upright. It can usually be seen early in the day, preening its feathers in the morning sun. It most frequently selects some very elevated branch, from which it can take a clear view of the surrounding country.

The Stock Dove has no white patches on the neck, or on the bend of the wing, as has the Ring Dove.

The Ring Dove generally builds its nest on a platform of sticks, placed in the fork of the branches of a tree or bush, whereas the Stock Dove builds its nest in a hole in a tree or cliff, as well as in rabbit burrows. Its nest consists of a few sticks or roots.

When it builds in a hole it sometimes makes no nest, simply laying its white eggs, measuring 1½ in. in length, at the bottom of the hole.

The writer once remembers watching from one of his bedroom windows, a pair of Ring

Doves select a site and then build their nest.

It was a considerable time before they selected a spot, which they seemed to consider suitable for the nest. The place at last

THE LESSER WOOD PIGEON, OR STOCK DOVE.
(Total length of male about 13½ inches.)

chosen was in the angle of some branches, and was a very secure and comfortable position. They then proceeded to build the nest. One bird stood on the site chosen, while the other bird went round the trees, and with its beak broke off any dead twigs it could find and gave

them into the beak of the other bird, which built the nest with the twigs received.

Rock Dove, or Blue Rock Pigeon.

It is said that all the different varieties of our domestic pigeons are descended from the

THE ROCK DOVE.
(Total length of male about 14 inches.)

Rock Dove, and show their descent by their reluctance to perch on trees.

Strong as is the flight of all the Pigeons, the swiftest of the family is the Rock Dove, and it requires a good and true shot to bring the bird down, as it darts from out of a cave amongst the cliffs.

The Rock Dove can be distinguished from

any other of the Pigeon species by the black bands across the wings, and also by the conspicuous white on the lower part of the back, but these marks do not distinguish it from the Domestic Blue Rock, which sometimes becomes wild and mingles with the Ring Dove and Stock Dove.

In Great Britain the Rock Dove is a local bird and nests in the cliffs on the coast in the north of England, as well as in Scotland and Ireland.

The nest is usually built on a shelf of rock in a cave, or on a ledge of a cliff. The nest is a flat, roughly-built structure, consisting of small sticks, seaweed, and grass bents.

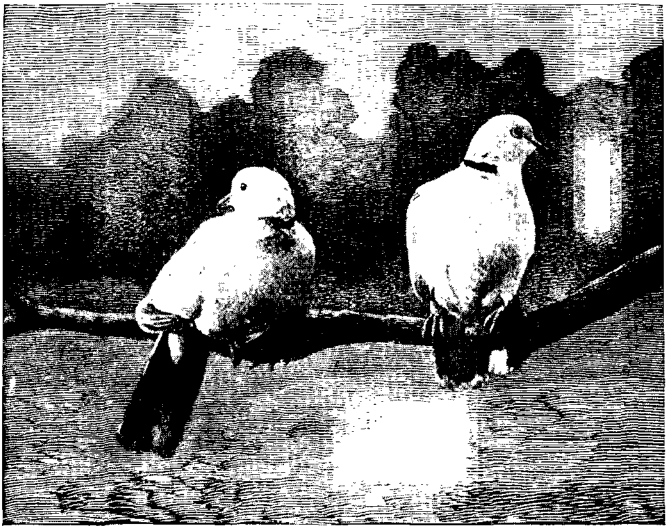
The eggs are two in number, white in colour, and measure about 1½ inches in length.

Turtle Dove and Migration.

The Wood Pigeon, Stock Dove, and the Rock Dove, are to be found in this country all the year round, but the Turtle Dove is only a summer visitor, and is seldom found here during the winter. Where the Turtle Dove spends the winter is at present unknown.

From foreign countries this pretty bird comes to us about the middle or end of April, and leaves us about the end of September. It is numerous in the Midland Counties, but it is not so common in the Southern Counties.

The Turtle Dove is smaller than the Stock Dove and Ring Dove, and can be distinguished by its ruddy brown colour, and by the white tips to the tail feathers, which can be very

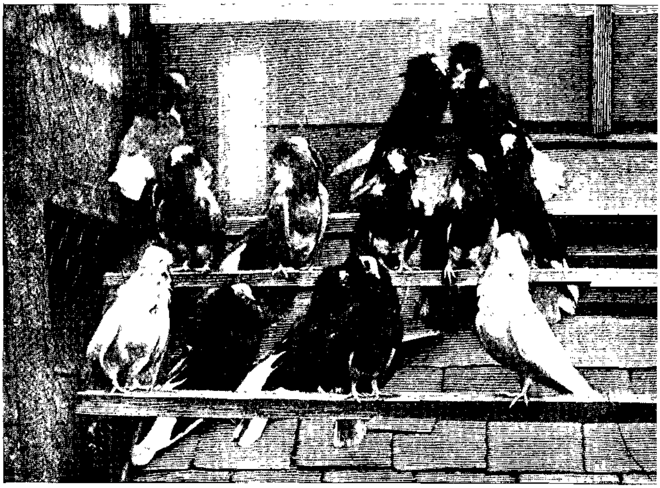


TURTLE DOVES.
(Total length about 11½ inches.)

easily seen when the bird is flying from you. It is a shy bird and flies swiftly and noiselessly.

The Turtle Dove makes its nest of small twigs, placed in an evergreen bush or in a hedge, often on the borders of a wood, and like a wise bird builds it in a concealed spot. In this nest it lays two creamy white eggs, which measure about 1¼ inches in length.

The Turtle Dove feeds on the seeds of weeds, especially the seeds of the Charlock or Wild Mustard, and it prefers these seeds to the grain of the Cereal Crops. For this reason it does the Agriculturist more good than harm.



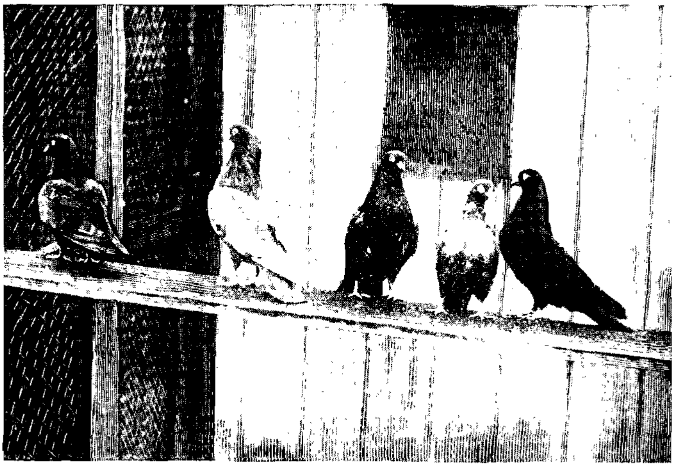
JACOBIN PIGEONS.

The Turtle Dove is fond of perching amongst the higher branches of tall trees, where unseen it utters its soft, soothing, cooing note so much in harmony with the warm sun, blue skies, and quiet calm of a summer day.

Domestic Pigeons.

By selection and breeding year after year, we have obtained from the Wild Rock Dove

all the varieties of our domesticated Pigeons. The Rock Dove, from the tip of the bill to the end of the tail, measures about 14 inches. Its colour is of a bluish grey, with two broad and distinct black bars across the closed wings,

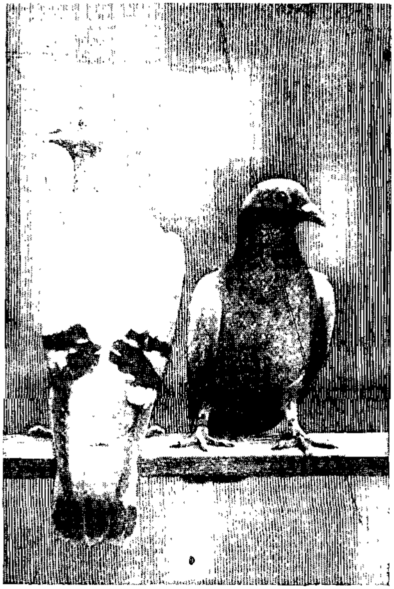


TUMBLERS.

the lower part of the back is whitish in colour. The tail is a deep grey, with a black bar at the end; the bill is dark brown, and the legs and feet are of a reddish orange colour.

The best known varieties of the domestic Pigeon are the Homing, Pouter, Fantail, Tumbler, Jacobin, Trumpeter, Barb, and Carrier, besides which there are many other varieties.

In many parts of the country, owing to the damage which the Pigeon does to the crops, and the mess they make about the buildings, it is best not to let them fly at large, but to keep them confined. When they are not likely to do damage to neighbours, they are very interesting birds to keep; but owing to the large quantity of food that they require, it is a question whether they are profitable.

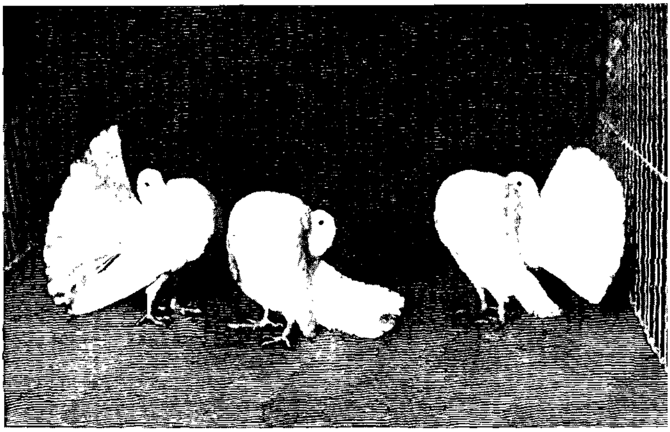

BLUE ROCK PIGEONS.

If allowed to be at large a Locker fixed to a wall, or on the top of a post, will make a suitable abode for them.

The Wall Locker ought to face South and West, because the wind and air blowing from these quarters is not so cold and searching as from the East and North.

A Pole Locker can be made from a barrel, divided into compartments, raised on a long

pole. It ought to be placed in a sheltered position, and if it has a background of thick trees or shrubbery, it is a pretty sight to see pigeons of various colours and kinds flying round it, perching on the roof or feeding on the ground beneath it.

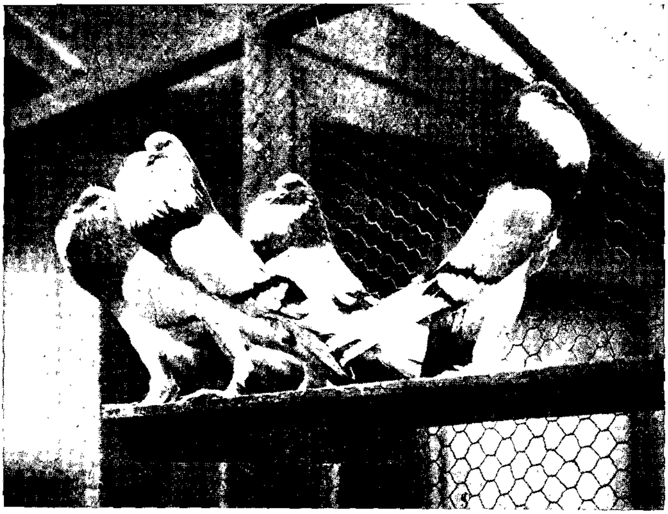


FANTAIL PIGEONS.

When Pigeons are kept for flight, such as Homers, or Tumblers, a loft or attic room makes an admirable place for them.

It is then usual to fix outside such a place a trap or cage, into which the birds may go and look about them before they take their flight, and to which they can return when they have finished their journey. This cage is made in such a way that you can let them out when you please.

Perhaps there is nothing that can illustrate to the mind, more forcibly and simply, what can be done by selection and breeding, than to consider the fact that such different-looking birds as the Pouter, Tumbler, Carrier, Jacobin,



POUTER PIGEONS.

and Fantail have had the Wild Rock Dove as their original ancestor.

In other words, man a long time *ago caught* and domesticated the Wild Rock Dove, and then by painstaking observation, pairing, and only sitting the eggs of *those Pigeons* which had varied in the direction that he had in his

mind, he at last bred the Pouter on the one hand, and the Homer on the other.

The Homing Pigeon.

The long distance messengers are called Homers or Homing Antwerps, and are very different in appearance to the Carrier Pigeon.

The Breed is now well fixed, and may be said to be of a uniform type. Forty to fifty pounds have been given for a good Homer, the winner in a race of 500 miles, but of course this price is a very exceptional one.

Homing Pigeons have to be taught. There is no doubt however that they naturally possess, to a remarkable degree, swift powers of flight and of finding their way long distances, to any point they wish to reach, by a sense which is now defined as "Sense of Direction."

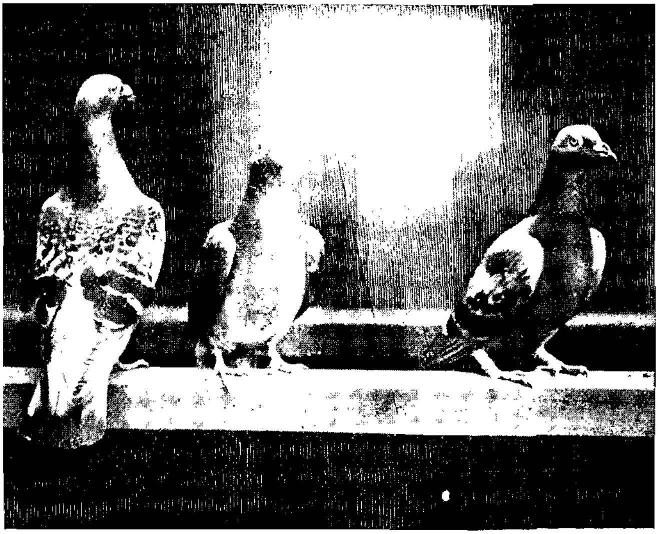
When the young Homers are about three or four months old, in July, their training begins. At first they are liberated about a mile from home. If they find their way back successfully, the distance is increased to three, then six, twelve, twenty-one, thirty-five, fifty, seventy-five, and one hundred miles.

When a bird is liberated from a basket or let go from the hand, it is called Tossing or Jumping.

Old birds may be Jumped further away from

home than the young ones. At three years of age 500 miles can be flown.

Stages after 100 miles would be about as follows:—100, 150, 225, 325, and 450. Of course these long distances can only be accomplished by the strongest, cleverest, and most



HOMING PIGEONS.

experienced birds. A great number of valuable birds are lost during these long flights.

About 800 yards per minute is said to be the average speed. The highest well-tested pace is 2200 yards per minute in a race of 150 miles. The greatest distance flown is 1100 miles, which was accomplished in America.

You may perhaps have noticed during the flying season of the year, at certain stations, hampers filled with live pigeons addressed to the Station Master, these are accompanied by a note asking him to liberate the birds and to write the time at which this is done on the address card, or it may be a request that he will send a telegraph message to the owner's address stating the time at which the Pigeons are released.

The owner then notes the time his birds reach home, and then comparing this time with the time on the address card, or the time stated in the telegram, he can reckon the time his birds have taken in doing the journey.

Pigeon racing, or Pigeon flying, is a most fascinating sport.

In England there are something like 50 clubs, devoted to the special purpose of breeding and flying the Homing Pigeon.

In Belgium, France, Germany, and Italy these clubs are much more numerous.

Belgium is the chief Pigeon flying country in the world; there every village has its club.

Races take place chiefly from the north-west of France, and are generally flown on Sundays.

During the Summer months trains loaded entirely with pigeons leave Brussels (the capital of Belgium), every Saturday.

The King of the Belgians gives prizes to the winners in the great annual race of 500 miles, in which over 3000 Pigeons often compete.

In favourable weather this distance is flown in one day.

You will ask yourself the question, how do the Pigeons perform these journeys? Of course there is much left to be discovered, but it may be said, with certainty, that the Wild Rock Dove, in its endeavour to escape danger, obtain food, and hand down offspring, developed certain powers which at last became instinctive in the race of the wild bird. The instinctive powers of sight, memory, sense of direction, strong healthy vitality, strong and rapid flight, very sensitive feelings to the different air currents and to the direction of the warm and cold winds. These instinctive powers, which in course of time have become natural to the Wild Rock Dove, have been inherited by the domesticated Homing Pigeon, and have been still further developed by man, through domestication, selection, breeding and training.

HINTS ON THE MANAGEMENT OF A GRASS HOLDING.

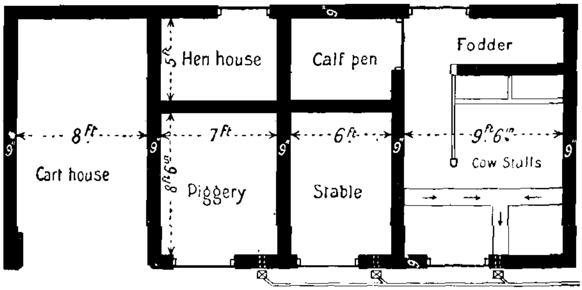
It is a very great help to a Cottager, living in the country, working for a weekly wage, to rent a small grass Holding which his wife and children can attend to, while he is earning his weekly wage.

It not only brings in a little profit, but adds to the interest of country life and helps to relieve its monotony. The fact of owning and tending some Live Stock of your own, teaches many things that you could not otherwise learn.

It teaches you to study closely and sympathetically the life and habits of animals; it helps to train you in business habits; it compels you if you are to be successful, to cultivate and watch the land as carefully as you watch and tend the live stock that find their support on it. It teaches you to watch the markets and to know the best time to sell, and the best time to buy; it gives you an interest in the land and in

the stability, good government, and peace of your country.

There is nothing that adds to the interest of life so much, as to be the possessor of some head of live stock of your own, and the feeling that something belongs to you. If you have children, helping you to look after the live stock, it trains



GROUND PLAN.—BUILDING ON A COTTAGE HOLDING.

them in sympathy, observation, and in quick action.

These small Grass Holdings make excellent schools to train up the children of a family, into competent workmen and helpful wives to successful Agriculturists.

The small Cottage Holdings, if there were many more of them in suitable districts, would produce a great deal of the butter, poultry, eggs, bacon, fruit, and vegetables which are now imported from abroad.

This would of course mean that more produce

would be raised from the soil, and more money spent amongst our own people. As a consequence the whole nation would be benefited. If every man working in the country knew, that when he had collected together sufficient capital and had acquired the needful experience, he

FRONT ELEVATION.—BUILDING ON A COTTAGE HOLDING.—BRICK AND TILE.

COST OF BUILDING AND LEAN-TO DAIRY.

Estate Labour,	- - - - -	£36	10	10
Fencing,	- - - - - -	6	0	0
Carting,	- - - - - -	21	0	0
Materials,	- - - - -	66	0	0
		£129	10	10

could supplement his wage and improve his position by renting or purchasing one of these Holdings, what a much brighter future would then be in store for the country workers.

Do not belittle Country work. The variety is

endless. If well done there is no work more noble, more difficult, or more important. There is no sameness about it. To plough, to cultivate, to sow, to keep the crops clean, to manure the ground, to gather the crops when ready, to stack them on the stack, or in the barn, to

BACK ELEVATION.—BUILDING ON A COTTAGE HOLDING.

thresh out the ripe grain from the ear; to trim a hedge, to lay it; to dig out a ditch and help to lay the drain pipes; to rear the live stock, to keep it to his best advantage and to market it in good condition.

To feed, watch, and care for the live stock on the Holding, cows, calves, pigs, and poultry, so that they may live healthy lives and yield

a profit. To force the garden to produce the best and most nourishing quantity of vegetables, and to keep the fruit trees and fruit bushes trimmed and manured, so that they yield an abundant supply of fine fruit.

To do all the work which this entails with success, is indeed the work of a strong, thoughtful, and capable workman.

Size of a Holding.

Perhaps the most convenient size for a Cottage Holding is 6 acres, and as a general rule it should consist entirely of grass land.

A man working for a wage has little or no time to cultivate arable land, and his wife will find that if she looks carefully after the Stock of the Holding, milks the cows, makes the butter and markets everything she has to sell in the best condition, it will fully occupy all her time.

Let your aim be, to place on the market the best quality of produce in the soundest and cleanest condition. It is only the best quality that pays. The foreigner can equal, if not beat, your second-rate produce, but the finest quality of British Agricultural produce always commands the top market price.

Three acres of the Holding had better be devoted to grazing, and the grazing plot ought, for convenience' sake, to be near the building.

Three acres should be devoted to mowing. If the mowing land yields 2 tons of good quality hay to the acre, so that when the stack is built it consists of 6 tons of fine quality hay, you have good reason to be satisfied with the crop.

INTERIOR OF A COTTAGE, ON A SMALL HOLDING.

Don't forget that it pays better to harvest a lesser quantity of sweet, wholesome herbage, than a much heavier quantity of rough, coarse herbage. Seize every chance, as far as the weather permits, to make the grass into hay in as short a time as possible, so that when stacked it is crisp to the touch, sweet to the smell, and of a greenish tinge to the eye.

Examine the grasses and clovers of which it consists, and if a large proportion of the stack is made up of White Clover, Rye Grasses, Meadow Foxtail, Fescues, Meadow Grasses, a little Sweet Vernal, and perhaps some Timothy, you may be quite sure that the stack will yield the stock an excellent feed during the winter time, and help the cows to give their best and richest milk.

After the Hay has been harvested, by the middle or end of July, if rain falls the grass or aftermath will continue to grow, and become a rich green herbage.

Of course if you wish you can mow your field again and make it into hay, but in most parts of the country it is best for the land to turn the cows into the aftermath, so that the grazing plot can have rest and the cows, an important consideration, a change of pasture.

Some experienced Holders say, that it is best after a few years to change round and graze where you have previously mown, and mow where you have previously grazed. This plan they state prevents the pasture becoming coarse.

During an average winter the cows can probably lie out till the middle or end of October; in some seasons to the end of November, but this of course depends upon the part of the country where the holding is situated.

When the nights become cold and aamp, the cows must be tied up at night and turned out during the day to get exercise and sunlight. They must not be left out again all night till about the middle of the following May.

The Live Stock of a Holding—Cows.

There is no fixed rule as to the best variety of Stock for a small holding. This must vary with the different conditions of the country; the quality of the soil of which the Holding is composed, whether it is in a damp or dry situation, whether exposed to sun or winds, and whether it is far from, or near to a market.

The Writer, from his own experience and from experience gathered from the Small Holders on his Estate, who have made these Small Holdings a success, ventures however to give the following hints:

You may take it for granted, that as a general rule, great care must be exercised in stocking the Holding, or the capital saved will be easily exceeded. To run into debt in order to stock a place, is like working with a load on your back.

A Welsh, or good half-bred cow, is a good cow to begin with, because these animals are not expensive to buy; they are good feeders,

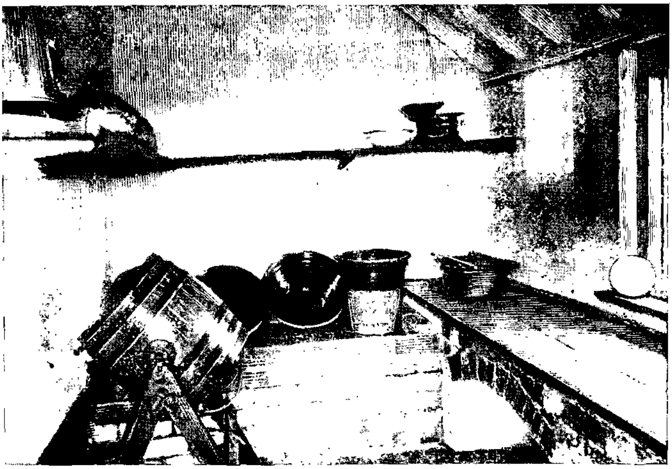
hardy by nature, quiet to handle, and give a fair supply of milk.

A LEAN-TO DAIRY ATTACHED TO THE NORTH END OF THE HOME ON A COTTAGE HOLDING.

The Kerry and Dexter Kerry cows are worth consideration. It is claimed for these small, hardy cows, that they will do well on rough

herbage on which other breeds would starve, and that they give more milk in proportion to the food they eat than any other strain.

Selected herds of Shorthorns and some Dutch herds have been established, which are said to produce 800 gallons per head per annum. The



INTERIOR OF THE DAIRY SHOWN IN THE PRECEDING ILLUSTRATION.

average production throughout the country is about 500 gallons per head per annum. This increased yield—from 500 to 800 gallons—in selected herds, has been brought about by only rearing the offspring of those cows which have produced the largest yield of rich milk on the least amount of food, and which have kept well and hardy in so doing, and by carrying

out the great law of selection, generation after generation, till a profitable herd has been established.

If you do not buy a cow with a calf, then it is well to buy a well-bred heifer calf. In May,

Photo. Charles Reid. DEXTER KERRY COW.

calves can be bought fairly cheap. After you have kept the calf for a year you can either sell it, or keep it for one of your own milkers.

If the land is good and has been well treated, you ought to be able to keep two milking cows and a heifer, or perhaps with skilful management three milking cows.

Above all things don't attempt to rear the calf from a cow that has any defects, but only rear the calves from those cows that you have found by experience to be the most profitable.

The Live Stock of a Holding—Pigs.

When you have two cows in milk, you will find a carefully selected breeding sow a profitable animal to keep. She will use up some of the spare skim milk, the slops of the house, the small potatoes and the green refuse of the garden.

The sow ought to have two litters in the year. The first litter in March, and the second in August or September.

On fine days if the sow has a ring in her nose, which will prevent her rooting up the grass, she ought to be turned out for a few hours so that she may obtain air and exercise, and a bite of grass.

As to whether it is best to sell the little pigs directly they are weaned, or to fatten them for pork and bacon, must depend upon the markets and the amount of food from the garden and holding, which you may have at your disposal.

In the Spring in many markets pigs are dear, and in the Autumn cheap, or sometimes there may be a brisk demand for little pigs just weaned from the sow.

If you can get £1 a-piece for the young pigs

when they are 11 weeks old, and the sow has had eight or ten in the litter, and she has been fed almost entirely on the waste products of the holding, you will not have done badly.

If little pigs are selling cheap and you think that in two or three months time Porkers will fetch a fair price, and have skim milk at your disposal, then instead of selling your little pigs you may think it better to fatten some, or all of them, for the Pork Market.

If however, when the porkers are ready for the market, you find your judgment has been at fault and the markets are against you, it may be advisable to keep back some of them and fatten them into bacon pigs.

Pig manure makes a valuable addition to the Manure heap.

The Live Stock of a Holding—Poultry.

As regards Poultry the Writer is strongly of the opinion that they ought to be housed in moveable houses, placed on the land. Two moveable houses to hold about 25 carefully selected fowls in each house, will be about as much as a Holding can carry with advantage.

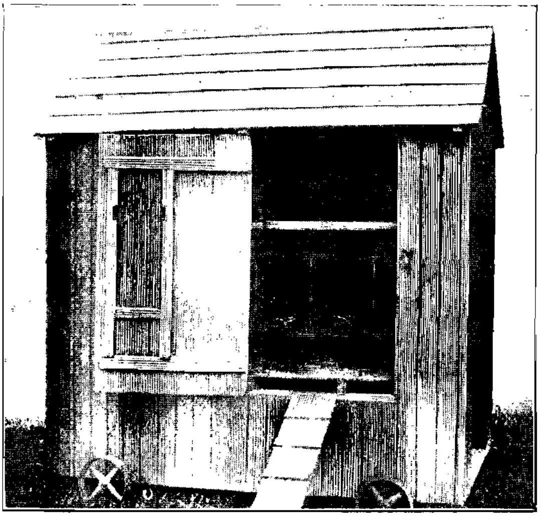
These moveable houses, if carefully moved about, prevent any one part of the land being made foul, and the poultry will scratch up the moss, aerate the roots of the grasses and clover,

Photo. Charles Reid.

SOW AND LITTER OF PIGS.

spread droppings, manure the land and destroy the insect life.

As to the breed to keep, no fixed rule can be laid down. It must depend upon the soil of the Holding, its position, and the demands of the nearest markets; for instance Dorkings only



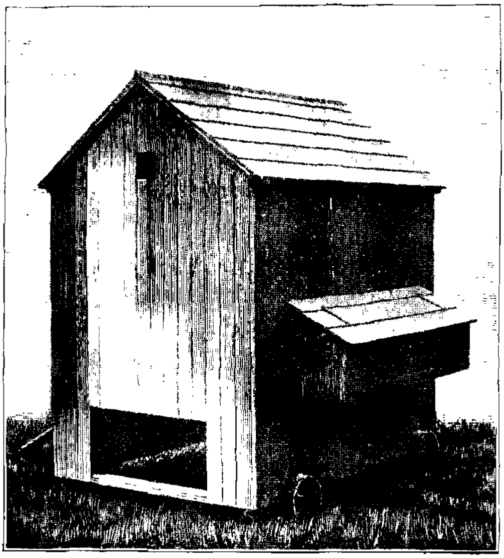
MOVEABLE FOWL HOUSE SHOWING THE INTERIOR AND NESTS.

do well in dry, protected and sunny situations, and when they do well there is no fowl that can beat them for table purposes.

The Plymouth Rock, on the other hand, is a general purpose fowl and is a strong, hardy bird, and will do well in lower, colder, and damper situations.

A Plymouth Rock will thrive where a Dorking vould die.

An excellent cross which is well worth consideration, is the cross between the Indian Game



MOVEABLE FOWL HOUSE SHOWING THE NEST BOXES AND THE SHELTER FOR THE DUST BATH UNDERNEATH.

nd Dorking, or the Indian Game and Buff Orpington.

If you have a fixed Poultry house it soon ecomes saturated and unhealthy, and the birds y constantly using the same stretch of land oul it, so that at last the stock will not touch its rowths. As regards feeding, certain principles

have been outlined in the chapter which deals with the confined Poultry of a Cottage Garden. The same principles of course apply to the birds kept on a grass Holding, with this difference, that birds on a Holding can roam about and obtain green stuff, grit, and insect food for themselves, and perhaps do not require so much grain and meal as the confined birds.

It is reckoned that the Manure made at night from 100 birds, per annum, equals in Manurial value 7 cwt. of Bone Dust, so that if you collect the manure made by the birds at night during the year from two moveable houses, it will manure each year ¾ to one acre of grass land, as effectively as if you had bought the best Bone Dust and applied it to the land. Think of the saving in doing this. If the three acres of grazing land were manured in this manner and otherwise well treated, you need seldom or ever buy any artificial manures.

The Poultry droppings ought to be placed in an old barrel, protected from rain, and occasionally, and this is important, a few spadefuls of earth mixed with it.

In placing the moveable Houses on the land, give them as much protection as possible. Let the front part of the house face the South and give it a shelter from the North by a hedge, palings, or any trees that may be near.

If the moveable Poultry Houses are placed at a distance from the dwelling house there may be danger of foxes.

A safeguard against the fox is to close the house directly the birds have gone to roost, and if you have a sharp watch dog, place his kennel somewhere near the Poultry House.

If you stretch a wire across the field near your houses, and place the kennel at one end of the wire, and allow the dog's chain to run along the wire, as if he were free, a fox will have to be very bold and hungry to attempt to take any of the birds.

The Live Stock of a Holding—Rabbits.

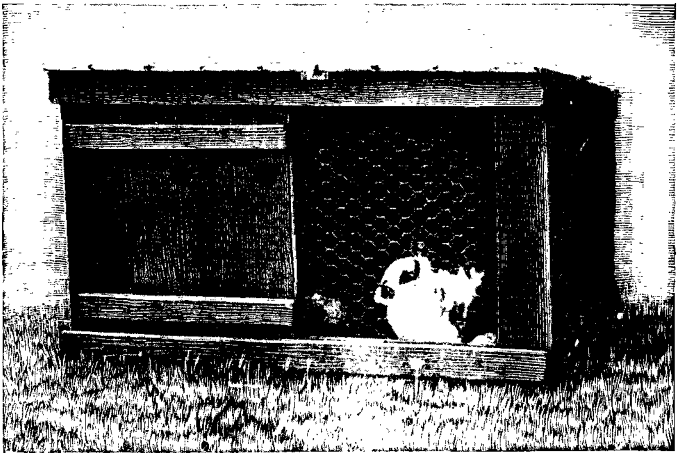
A few moveable Rabbit Hutches, similar in construction to the illustration, moved about the grass land, will keep you supplied with Rabbits and leave some over to sell. If these Hutches are moved three times a day the Rabbits, if given a handful of Oats and Bran once a day, will during most of the year get their own living from the grass through the meshes of the wire bottom of the Hutch.

Place the Hutches on the weakest part of the holding, and give the Rabbits a handful of Oats and Bran mixed each morning, moving the Hutch three times a day and the weak spots will soon become strong spots. In other

words—in place of rough, rubbishy, indigestible herbage, there will appear sweet, green, digestible herbage.

Manuring a Holding.

There is nothing that contributes to the success of a Holding more than the manner in which the manure heap is made.



A MOVEABLE RABBIT HUTCH.

The spot on which the Manure Heap is made, ought to be as handy as possible to where the cows are tied.

Above all things collect the liquid manure from the pig-sty and cow house into some kind of reservoir, so that you can from time to time conveniently empty it over the heap.

It adds very much to the good that the manure will do, if you give the heap a good soaking with the liquid manure a day or two before you apply it to the land.

The best manner of making the Manure Heap is given on pages 17, etc., and there is no need to repeat it here, except to emphasise this point. Don't attempt to garden or farm on a large scale, or on a small scale, unless you are prepared to take pains and trouble in making the Manure Heap.

The best bedding for cattle is a good strong, flinty, wheat straw. It keeps them dry and clean, it causes the house to smell sweet, and is, without a doubt, the most suitable foundation upon which to make the most useful quality of manure.

As hay takes a great deal of plant food out of the land it is necessary, if the yield of the field is not to fall off in weight and quality, that this plant food should be replaced, and the best method of replacing it is by manuring the field with the manure from the stock.

Late Autumn is perhaps the best time to apply manure to the land, because the rain and weather help to wash it into the soil, so that when the grasses begin to grow in the following Spring, they find plenty of food available all around them which their roots can take in.

It is best to spread the manure over the land at once, and not to allow it to stand in heaps before being spread.

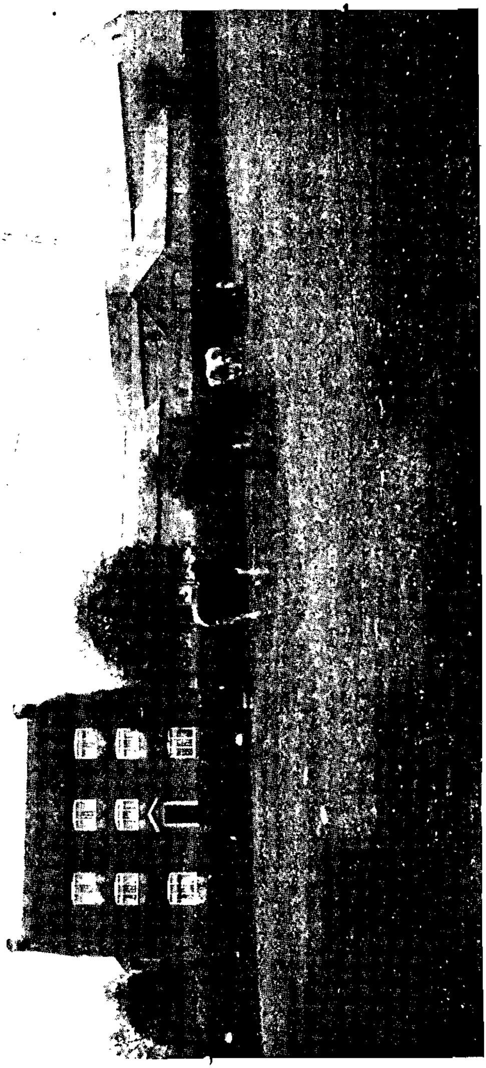
The grazing land does not require so much manure as the mowing land, because the grazing land is grazed by stock, which have fed on the hay that has been harvested from the mowing plot, and to the hay there has probably been added some chopped roots and a little corn or cake.

The Stock returns a certain proportion of the corn, cake, hay, and roots to the land, which in due time is converted into nourishing food for the Grass and Clover plants.

Even though the Stock has been well fed and the droppings spread several times during the year, the pasture harrowed at least once in the year—in Spring; the thistles and weeds kept down, and the herbage eaten off closely by the stock, you will still find that the grazing pasture if it is to be kept in health, will require from time to time a little outside assistance.

If the manure heap will not run to it, then the application of either Bone Dust, or Basic Slag, applied in the Autumn, will refresh the grazing land.

Basic Slag is a cheaper manure than Bone Dust, and if applied to the heavier lands will improve the quality of the pasture very con-



HOUSE AND BUILDINGS ON A LARGE FARM.

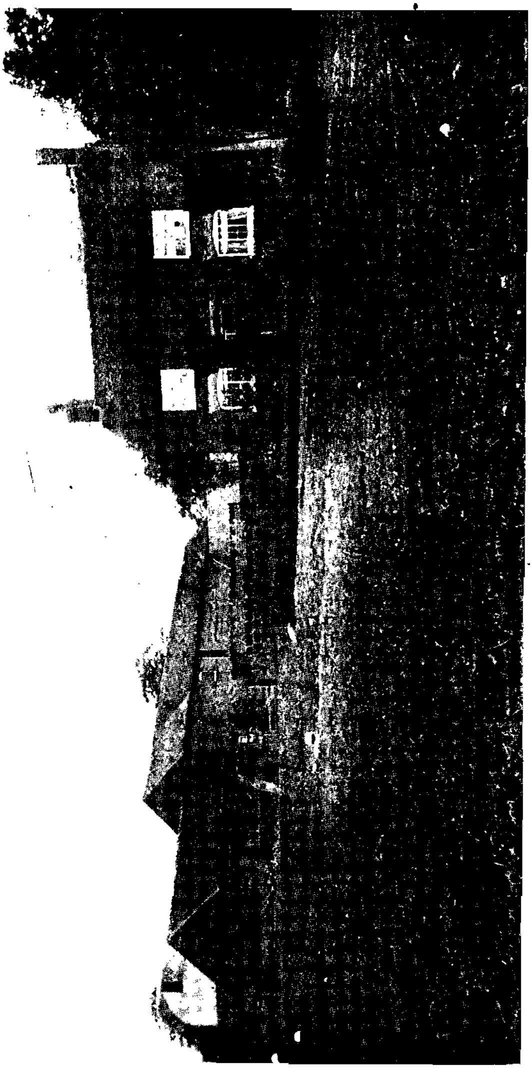
siderably; on the other lands, principally the lighter lands, to apply it is to throw money away.

Some Experiments.

The following results of a series of experiments, made and exhibited by one of the Agricultural Colleges at the Royal Agricultural Show, are very interesting. Small boxes containing grass sods of soil were taken from the experimental plots at the College. These boxes were arranged side by side, and a full account of the plots written above the boxes which the sods represented.

The quality of the soil, the name of the artificial manure used, and the quantity that had been applied to the acre. In fact every particular was given so that every one, even if they knew nothing about Agriculture, could understand the result of the experiments.

What made the series of experiments so interesting was this: A box containing a portion of sod from the same soil taken from an unmanured plot, was placed alongside each box containing the sod from the manured portion. In some cases, unless you had seen it for yourself, you could not have realised what a difference there was between the unmanured plots and the manured plots.



HOUSE AND BUILDINGS ON A SMALL FARM.

The herbage of the sod taken from the unmanured plot, looked coarse, sour, and brown, with no sign of clover or useful feeding grasses. Any one could see that cattle would not eat it.

Where the Manure applied had suited the soil, the good grasses and clover were growing sweet, green, and strong.

In cases where Basic Slag suited the soil (the heavier clay soils as a rule), the result seemed almost miraculous. In place of the harsh, coarse, sour, brown-looking herbage of the unmanured plots, under the influence of Basic Slag *there* had grown *crisp*, sweet, green-looking grasses and clover.

But the experiments made on the lighter lands seemed to prove that neither Basic Slag, or Bone Dust are the most suitable forms of manure to apply alone.

The series of experiments made on the lighter lands proved that Basic Slag alone did not answer; nor did Potash, in the form of Kainit, answer alone. But when Basic Slag *and* Kainit were mixed and applied, the results were most satisfactory.

Basic Slag is a Phosphate manure, and contains a quantity of Lime. It is about half the price of Bone Dust; *but* many farmers prefer Bone Dust when they can get it good, because they say it lasts longer in the soil. If Basic

Slag or Bone Dust is likely to suit the soil, *then from 7 to 10 cwts. to the acre*, applied in the Autumn before the rains, will sweeten the herbage of the grazing field and force the good grasses and clovers to grow strong and vigorous, and the next year you will probably be repaid by the increased yield of richer milk which the cows will give.

Hedging and Ditching.

It *is* very *important* that the boundary Hedges of the Holding should be kept sufficiently strong to keep your own cattle from straying, and to prevent other people's cattle from breaking in.

If the Hedges are allowed to grow high and *the bottoms thin*, there will *soon appear* inconvenient gaps, which may cause much annoyance and it may be loss, for remember that if your cattle get out and graze over other people's land, you are liable to be summoned for the damage they do. And if a number of stock get into your field, they may in a very few hours eat the keep which would last your own stock for months.

The great object of all hedging and ditching is to keep the Hedges thick and healthy, especially so at the bottoms, and the ditches well cleaned out, so that the water will flow in them and not over the land.

It helps to make a thick and healthy hedge, if the earth dug out of the ditch is built up along the bottom of the hedge.

It is skilled work and requires practice to know how to make a satisfactory hedge, and to make a clean free running ditch.

Mangel, Cow Cabbage, and Lucerne.

If there is room in your garden, in order to increase the winter feed, it is well to sow some Mangel Wurzel.

When the early potatoes have been dug, plant some Mangels in their place. It is a wise plan also to buy some Cow Cabbage plants and plant them for Autumn use.

If your garden is not large enough, which may be the case, and you can spare a little time from work, and can get the consent of your landlord, dig and cultivate a small plot of your grass land on which to grow test crops. Of course this plot of ground must be wired or fenced in, to keep out the stock.

From experiments made by the writer in growing Lucerne, he is fully convinced that this plant should be tried in every district. In places where it succeeds, three good growths of rich, green, feeding stuff, even in a dry season, can be obtained in the year.

After the plant has become established, there

is no further trouble. It should be drilled in rows in the Spring, and for the first year the weeds between the young plants must be hoed, but when the Lucerne gets strong its vigorous growth smothers any weeds which attempt to grow. A small plot of Lucerne yields a large quantity of green food, which is of the greatest use to a Small Holder, especially during a dry season. Lucerne when once established will yield good crops for eight or ten years. The Mangel, Cow Cabbage, and Lucerne, are three very useful crops which every Small Holder should turn his attention to.

With the exception of a little corn and cake, which it may be advisable to buy in the winter to help the milk supply, and some straw—if you make the best of everything there ought not to be anything to buy which a small Holding does not produce.

If the Cows, Pigs, and Poultry are to be kept healthy and yield the best return, their housing places must be kept sweet, clean, warm, well lighted and ventilated. All inside places should be white-washed at least twice a year. Hedge trimmings and dead bracken make a fair bedding, but not so healthy or cleansing as wheat straw.

The one great object ought to be to try and make the Holding as nearly self-supporting as

possible, not only for your stock, but for your household.

It ought to supply the household with bacon, eggs, poultry, butter, milk, vegetables, and fruit, and sometimes with mushrooms and blackberries, as well as supplying nearly all the food for the milking cows, pigs, poultry, rabbits, and all the manure the land requires.

In the present day of keen competition and close prices, nothing must be wasted and nothing overlooked.

It is only the careful, painstaking, and experienced man and wife working together, with their heart in the work, who can hope to make the small Holding a success.

VOCABULARY.

Absorb (absŏrb′): to suck up, to soak up.

aerate (ā′er-āte) the soil: to help the air to circulate in the soil by breaking and *loosening it.*

agricultural college: a college devoted to the teaching of agriculture and farming.

agriculture (ăg′ri-cŭlt-ūre): cultivation of the land; farming.

alternate (ăl-ter′nāte): to change by turns.

analyse *(ăn′a-lyse): to separate* into elements or parts.

analyst (an′a-lyst): one who analyses.

Anglesey: an island on the N.W. coast of Wales.

angular (ăn′gu-lar): sharp-edged, rough pieces.

appliances *(ap-plī′ances): the* tools or instruments used are called the appliances for doing the work.

apprenticeship (ap-prĕn′tīce-ship): to serve or work a time to learn a trade.

arable (ăr′a-ble): plough land, tilled land.

Argentine: a South American Republic.

artificial (är-ti-fi″cial): made, not natural.

asset (ăs′set): possessions, the things which belong to one.

authorities *(au-thŏr′i-ties): persons* who speak with knowledge.

available (a-vāil′a-ble): at hand, ready for use.

bacteria: minute living organisms.

Bean aphis: a small insect that *infests the bean plant.*

bin: a place in which corn is kept in large or small quantities.

blend (blĕnd): to mix in order to obtain a given result.

blue vitriol (vĭt′ri-ol): sulphate of copper, used for dressing wheat before sowing.

***bond** or **band**: the material* used for tying a sheaf of corn, truss of straw, etc.

botanist (bŏt′a-nist): a person skilled in the knowledge of plants.

bran (brăn): the outer skin of the wheat berry.

breaking (breāk-ing) the wheat: the wheat in the mill passes through machines called the 1st, 2nd, 3rd, and 4th breaks.

brewers' grains: the barley grains after they have been used for malting.

bulge (bŭlge): to overhang.

burrow (bŭr′rōw): to make holes, a rabbit hole.

butts (bŭtts): the portion of the sheaf below the bond.

calcareous (cal-cā′re-ous): compounds of lime and carbonic acid.

carbonic (cär-bŏn′ic): pertaining to carbon.

cart horses: the heavier breeds of horses used on a farm for ploughing and general work.

cereal (cē're-al) crop: grain crop.

cesspool (cĕss'-pool): receptacle for drainage.

chaff-cutter: machine for chopping hay and straw for food for the cattle.

characteristics (char-ac-ter-ĭs'tics): peculiar to.

chopped(chŏp-ped): passed through the chaff-cutter.

clămps: the roots (mangels, etc.) are stored in quantities and covered with straw or dry litter, and then the earth is thrown over all and the clamp is thus made frost and water proof.

cleavers (clēav'ers): a weed commonly found in the hedgerows. Goslings and young turkeys are very fond of the tender growth of this plant.

clods (clŏds): masses of earth.

clubbing (clŭb-bing): club-root, a disease of the root crops.

combination(com-bi-nā'tion): working together, union, or association.

community (com-mū'ni-ty): people in general.

compact (cŏm'pact): firm, close.

compensate (com-pĕn'sāte): to make amend for; to make up for.

competent (cŏm'pe-tent): fitted for, suited to.

compo heap: waste heap of the farm.

composition(com-po-sĭ''tion): mixture of several materials; the manner of making (the heap).

compound (cŏm'pound): made up of different materials mixed together.

compound flower: a flower that is composed of many flowers.

concentrated (con-cĕn'trāted): brought into a small compass.

concrete (cŏn'crēte): a mixture of gravel, pebbles or broken stones, with cement, which in drying hardens and is impervious to wet.

conserve (con-sèrve): to preserve.

consolidate (con-sŏl'i-dāte): to make firm.

co-operation (co-op-er-ā'tion): joint labour.

cotton cake: a cake for feeding cattle, made from cotton seed.

counteracts (coun-ter-ăcts): hinders.

cowbane: a poisonous weed.

cramming (crăm-ming): to feed by force.

creamery (crēam-ery): place to which milk is sent to be separated, etc.

cube: a four-square solid body.

cultivator (cŭl'ti-vā-tor): an implement used to cultivate the soil.

decomposes (de-com-pōses): decays.

decorticated (de-cŏr'ti-cā-ted) cake: cake for feeding cattle made of seeds from which the husks or skin has been taken away.

deficiency (de-fĭ''cien-cy): shortage.

deficient (de-fĭ''cient): short of.

designer (de-sīgn'er): one who contrives or plans something.

devastate (dĕv'as-tāte): ruin, destroy.

Dexter Kerry: a breed of small cattle.

disinfecting(dis-in-fĕct-ing): cleansing from impurities.

disintegrating (dis-in-te-grā'tion): breaking up.

dissipate (dĭs'si-pāte): scatter, to disperse.

distinctive (dis-tĭnct'ĭve): a marked difference.

diverse (dīverse): different.

dodder (dod'der): a parasitic weed.

dormant (dŏrm'ant): sleepy, resting.

dough (dōugh): the flour, etc., mixed for making bread.

drill (drill): an implement used to plant corn and seeds.

Dūtch barn: a roofed building with open sides used for storing hay, grain crops, etc.

eliminated (e-lĭm'i-nāt'ed): done away with.

emphasize (em'pha-sīze): to specially impress.

equalizes (e'qual-īzes): makes equal.

eradidate (e-răd'i-cāte): to root out.

erroneous (er-rō'ne-ous): wrong, false.

essentials (es-sĕn'tials): things necessary.

estate (es-tāte'): property, especially land.

evaporation (e-vap-o-rā'tion): giving off moisture.

exceptional (ex-cĕp'tion-al): unusual.

excessive (ex-cĕss'ĭve): out of proportion.

expanses (ex-pănses) of land: stretches of country.

expenditure(ex-pĕn'di-tūre): money spent, act of spending.

experiments (ex-pĕr'i-ments): to make trials.

exterminate (ex-tĕr'min-āte): to utterly destroy.

eye-bright: a weed of the fields.

facilitating (fa-cĭl'i-tat'ing): making easy.

facsimile (fac-sĭm'i-le): an actual copy, like the original.

fallow (făl'lōw): land tilled and unsown.

fascinating (fas-ci-nā'ting): engrossing, pleasing.

ferment (fĕr'ment) works: yeast ferments or works.

film (fĭlm): a thin covering.

fodder (fŏd'der): the food used for feeding cattle is termed fodder.

foraging (fŏr'ag-ing): to search for food.

fragments (frăg'ments): broken portions, detached portions.

friable (frī'a-ble): easily crumbled.

furrow (fŭr'rōw): the ridge thrown up by the plough.

garlic (gär'lic): a species of wild plant having a strong flavour of onion.

gaseous (găs'e-ous): being in the form of gas.

generations (gen-ĕr-ā'tions): a succession of lives.

germ: the portion of the wheat berry or seed that contains the life or growing portion.

germinate (gĕr'mi-nāte): to grow.

gluten (glū'ten): a viscid elastic substance produced from grain.

good heart: in good condition.

granary (grăn'a-ry): storehouse for corn.

grazed (grāze'd): fed off by stock.

harbour (här'bour): to shelter; a place of safety.

harmonise (här'mo-nīse): to be in concord, to agree.

havoc (hăv'oc): great damage.

headlands (hĕad'lands): the margins of a field which are trampled on by the horses when turning, and which has to be worked last of all in a cross direction.

heifer (hĕif'er) calf: the female calf.

holding (hōld'ing): a portion of land rented for the purposes of agriculture.

horsetails (hŏrse'tails): a species of wild grass.

imperative (im-pĕr'a-tīve): very urgent, quite necessary.

impervious (im-pèr'vi-ous): not to be passed through, not to be penetrated.

impoverished (im-pŏv'er-ish'ed): made poor.

impregnated (im-prĕg'nāted'): to communicate the virtues of one thing with another.

impurities (im-pū'ri-ties): foulness.

inclement (in-clĕm'ent): severe, when applied to the weather.

inconspicuous (in-con-spĭc'ū-ous): not noticeable.

indispensable (in-dis-pĕn'sa-ble): cannot be done without.

inflated (in-flāte'd): blown out.

injurious (in-jū'ri-ous): does harm, harmful.

insoluble (in-sŏl'ū-ble): cannot be dissolved.

instrument (in'stru-ment): that with which work is performed; anything by which an effect is brought about.

invariably (in-vā'ri-a-bly): constantly.

invented (in-vĕnt'ed): something new brought forward.

inverted (in-vèrt'ed): turned upside down.

involved (in-vŏlve'd): drawn into by necessary consequence.

judiciously (ju-dĭ''cious-ly): with judgment.

kernel (kèr'nel): the inside part of the grain.

Kerry: a county in the south-west of Ireland.

kneading (knēad-ing) trough: the trough in which the dough is kneaded.

labyrinth (lăb'y-rinth): intricate, a maze.

ley: a field on which the clover and seeds are growing.

lime (līme): a substance obtained by burning limestone, shells, etc.

lime-kiln (līme'-kĭln): the kiln in which the lime is burned.

linseed (lĭn'seed) cake; for cattle, made from linseed.

litter (lĭt'ter): the bedding of the stock.

logic (lŏġ'ic): the art of reasoning.

longitudinal (lon-ġi-tū'di-nal): being in the direction of the length.

lop-ears (lŏp-ears): long ears dropping one on each side of the head.

Lucerne (Lū'cerne): a species of trefoil, a fodder plant.

majority (ma-jŏr'i-ty): the greater number.

maltster (malt'ster): one who prepares malt.

manufacture (man-ū-făct'ūre): to make.

marvels (mär'vels): wonders, out of the common.

maturity (ma-tū'ri-ty): full grown.

mechanical (me-chăn'ic-al) action: natural, even action; natural action of the soil.

mildew (mĭl'dew): a juice on plants causing disease.

minute (mi-nūte): small.

monotony (mo-nŏt'o-ny): sameness.

multiplying (mŭl'ti-plȳ-ing): increasing.

myriads (mȳr'i-ad): great numbers.

nitrates (nī'trates): salts formed of nitric acid and a base.

nitrogen (nī'tro-gen): the element of nitre, a substance which, with oxygen, constitutes the atmosphere.

nitrogenous (nī-trŏg'e-nous): producing nitre.

nutriment (nū'tri-ment): food.

offal (ŏf'fal): the waste portions.

Oregon: a state, a part of the United States of America.

organic (or-găn'ic): plant food.

overheats (ō-ver-hēats): heats the blood.

overlapping (ō-ver-lap'ping): folding over.

palatable (păl'a-ta-ble): pleasing to the taste.

paling (pāl'ing): an enclosure of pales; a fence.

particles (pär'ti-cles): minute portions of matter.

paying crop: a profitable crop.

percolate (pėr'co-lāte): to filter through.

perfected *(pėr'fect-ed): made complete.*

pests (pĕsts): insect plagues.

phosphates (phŏs'phates): a salt formed by the combination of phosphoric acid with a salifiable base.

phosphorus (phŏs'phor-us): a combustible, yellowish, semi-transparent substance.

pitch (pĭtch): a thick tenacious substance from the pine.

pitch of excellence: degree of excellence.

plantlet (plănt-let): a small plant.

pollards (pŏl'lards): a mixture of bran and meal.

porous (pō'rous) soil: having minute passages through which the moisture can escape.

potash (pŏt'ash): a vegetable fixed alkali from the ashes of plants.

preening (preen-ing): cleaning and adjusting the feathers.

problem (prŏb'lem): a question, for solution, to which the answer has to be discovered.

prodigious (pro-dĭg'ious): very great.

prohibitive (pro-hĭb'it-ive) prices: at too great a cost.

propagate (prŏp'a-gāte): to cause to go on from generation to generation.

prostrate (prŏs'trāte): flat on the ground.

puddle (pŭd'dle): work together, a wet impervious mass.

puny (pū'ny): small and weak.

quarter (*quar'ter*): 8 bushels *of* grain.

quick: the white thorn.

rape cake: a cake for cattle made from rape seed.

receptacle (re-cĕp'ta-cle): a place or vessel into which anything is *put or received.*

reinvigorate (rē-in-vĭg'or-āte): to renew vigour in.

rental (rĕnt'al): payment made for the hire of land, etc.

research (re-sėarch'): continued search after.

respective (re-spĕct'ive): relative.

retailer (re-tāil'er): one who sells in small quantities.

retentive (re-tĕn'tive): to keep, to retain.

reverse (re-vėrse): the opposite.

rising (of the dough): the act of fermentation.

rotation (ro-tā'tion): circling round, coming back to the starting point.

rust (rŭst): a disease of the grain crops.

rye: an esculent grain.

sanfoin : a fodder plant.

saturated (săt'ū-rāted): full of, soaked.

scythe (scȳthe): an implement used for cutting hay and the grain crops.

secreted (se-crēte'd): produced.

section (sĕc'tion): a part of something; a distinct part of a portion.

seeded (seed-ed): planted or sown.

sharps: offal of the wheat, having less flour in it than the middlings.

sheaves: bundles of corn as bound up when reaped.

shimmer (shĭm'mer) green: tinged with green.

shock or **stook**: a collection of sheaves set up in a field.

shrewd: sharp, careful.

shrivelled (shrĭv'elled'): dried up, *wrinkled*.

"**sit the eggs**": the eggs usually given to a hen to hatch are called "a sitting."

slovenly (slŏv'en-ly): careless, lazy.

small holder: the tenant of a small holding.

smut (smŭt): a fungus on corn.

soluble (sŏl'ū-ble): capable of being dissolved.

solve (sŏlve): answer, find out.

spouted dung yards; having gutters to collect and convey the roof-drainage.

stability (sta-bĭl'i-ty): fixedness of purpose, firmness.

stagnant (stăg-nant): stale, motionless.

statute acre: 4840 square yards.

stolons (stō'lon): an offshoot.

straw (straw): the stalks of the grain crops.

stubble (stŭb'ble): the root and portion of straw of the crop left on the fields after the harvest. The field, after a grain crop is reaped and carried, is called a stubble.

stunted (stŭnt-ed): of small growth.

subsoil (sŭb'soil: the bed or stratum of earth which lies immediately below the surface-soil.

succulent (sŭc'cu-lent): juicy.

superfine (sū'per-fīne): of superior quality.

superintend (super-in-tĕnd'): manage, oversee.

supplemented (sŭp'plē-ment-ed): added to, increased by.

suppleness (sŭp'ple-ness): pliable, flexibility.

sustaining (sus-tāin'-ing): supporting.

swathes (swāthes): the rows of the crops cut by the scythe.

swedes (swēdes): a variety of turnip.

sympathetically (sym-pa-thĕt'ic-al-ly): with common feeling.

system (sȳs'tem): regular order or method.

tap-root (tăp'-root): the main root.

technical (tĕch'nic-al): according to rule.

Tamworth: a town partly in Staffordshire and partly in Warwickshire.

temperature (tĕm'per-a-tūre): relative degree of heat or cold.

tested (tĕst-ed): tried.

texture (tĕxt'ūre) (of the soil): the relative arrangement or compactness.

thatched (thătch-ed): covered with straw, etc.

theoretical (the-o-rĕt'ic-al): speculative, not practical.

tillage (tĭll'age): the cultivation of the land.

tilth (tĭlth): the state of being tilled or prepared for seed.

tinge (tinge): a faint colour.

transfer (trans-fėr′): to convey from one place, or person, to another.

transplanted (trans-plănt-ed): to remove or plant in another place.

transverse (trans-vėrse): cross direction.

tripod (trī′pod): three-legged.

truss (trŭss): a bundle of straw weighing 36 lbs.

union (un′ion): the bringing of things together so that parts make up a whole.

unsymmetrical (un-sym-mĕt′ri-çal): out of proportion.

variation (va-ri-ā′tion): a partial change in the form.

varieties (va-rī′e-ties): many and different.

vetches (vĕtches): tares, grown as a green crop and used largely for horses during the early summer.

vitality (vi-tăl′i-ty): the principle of life.

water hemlock: a poisonous plant.

weathered barley: discoloured by the weather.

wire worm: the larva of the click beetle or skipjack.

yeast (yēast): a preparation to cause the fermentation of dough.

yellow rattle: a weed found in meadows and about sandhills

yield (yiēld): to produce.

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